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MILDEW-RESISTANT ROSES: WITH SOME SUGGESTIONS AS TO INCREASING THEIR NUMBER.

By WALTER EASLEA, F.R.H.S.

[Read July 17, 1917; Mr. W. H. DIVERS, V.M.H., in the Chair.]

THE subject of Rose mildew has been so ably dealt with in the past, both in the JOURNAL OF THE ROYAL HORTICULTURAL SOCIETY and in other Journals, that I do not propose to attempt a description of this pest, even had I the technical knowledge to do so. My object is rather to ascertain if there be a possibility of increasing the number of mildew-resisting Roses. Should there be any representatives of the Sundriesmen here who do not entirely wish for mildew to disappear, even though they sell preparations that are absolute preventives, I would assure them at the outset that, in my opinion, our gardens will never be absolutely free from the fungus, seeing that there are so many lovely varieties that are badly addicted to mildew, but which no amount of persuasion could induce us to banish from our collections, and that they can go on making their preparations with a certainty that there will be a demand for them.

Yet, while I admit that much, I am very hopeful that the many eminent amateur hybridists of the Rose will soon obtain for us a number of mildew-resisting varieties, so that to a large extent the fungus will be banished from our Rose gardens.

Now, why do Roses take mildew? It is because the leaf is not able to resist the spores of the fungus, which is always close

by to attack it. This may be proved by growing certain varieties notoriously prone to mildew under glass and treating them to an application of sulphur fumes from Campbell's or any other vaporizer. They are for the time being encased in a coating of sulphur that defies the mildew spores, and it is only when new growths appear that attacks succeed if the vaporizing is not persisted in.

Now, we cannot encase Roses outdoors in like manner, however carefully we spray them, so that to have Roses free of mildew we must raise Roses with mildew-resisting foliage.

I readily confess that the subject opens out possibilities that are far too vast for me to attempt to describe in the limits of a paper, but I will endeavour to give a few ideas that may form the basis for some hybridists who have the opportunity to experiment.

I have noticed, as no doubt most observers have done, that mildew is very rife among some of the old tribes of Roses such as *Rosa gallica*, and I think we can very justly blame them for handing down to the so-called Hybrid Perpetuals this tendency to mildew, which has been largely responsible for their banishment from modern gardens. Take old 'General Jacqueminot' for instance, or 'Abel Carrière,' or 'Mrs. Sharman Crawford,' what terrors they are for mildew! Did they inherit it from the 'Gallicas' or 'Damask Perpetual'?

To show that Roses have the power to perpetuate the plague among their descendants, I may point out one example.

We all know that the ubiquitous 'Dorothy Perkins' is a Rose frequently blighted by mildew, and we know it has not inherited it from *R. Wichuraiana*, its seed parent, but from 'Mrs. Sharman Crawford,' its pollen parent. I do not claim that this is an absolute test, because probably instances could be cited of the reverse action; but I will give an illustration on the other side.

One of the grandest Rambler Roses of modern times is 'American Pillar,' a Rose with glorious foliage and splendid trusses of blossom. This was raised by Dr. VAN FLEET, of the Department of Agriculture, Washington, from *R. Wichuraiana* \times *R. setigera*. Here we have an instance of a thick leathery leaf, such as *R. setigera* produces, being blended with the tiny foliage of *R. Wichuraiana*, and yielding the grand foliage of this fine variety. *R. setigera* was also one of the parents of 'Reine Olga de Wurtemberg,' which is also renowned for its beautiful mildew-resisting foliage.

As is generally known, *R. Wichuraiana* has been largely employed by Rose-hybridists as the seed parent of many of our best Ramblers, and when it has been crossed with the glossy-leaved Tea Rose it has produced mildew-proof foliage. Such examples are found in 'Jersey Beauty,' 'Léontine Gervais,' 'Albéric Barbier,' 'François Juranville,' 'Dr. Van Fleet,' 'Miss Helyett,' 'Edmond Proust,' 'Gardenia,' and many others.

It seems therefore, if we would continue this type, we must use the glistening-foliaged Tea and China Rose as pollen parents. Strangely, by crossing *R. Wichuraiana* with large-flowered Hybrid Perpetual Roses

like 'Mrs. Sharman Crawford' and 'Paul Neyron,' we obtain the huge trails of blossom of 'Dorothy Perkins' and 'Minnehaha,' but, alas, also the mildew. We see mildew badly bequeathed to the offspring in the case of 'Wichmoss.' *R. Wichuraiana* was the seed parent, and the Moss Rose 'Salet' the pollen parent.

'Salet' is one of the worst Moss Roses to mildew, so that although we have a curious blending of *R. Wichuraiana* and the Moss Rose in 'Wichmoss' it is not the type we need to perpetuate.

I think Dr. WILLIAMS is on the right lines in using 'Jersey Beauty' as a seed parent. His two fine novelties, 'Emily Gray' and 'Lucy Williams,' are splendid mildew-proof Roses; and 'Shower of Gold,' raised by Messrs. PAUL & SON, owes also its freedom from mildew to 'Jersey Beauty.'

Dr. VAN FLEET has been successful in the use of *R. sinica* or *laevigata* as pollen parent. By crossing *R. Wichuraiana* with the thick, smooth-leaved species, *R. sinica*, he has produced 'Silver Moon,' a Rose that will become very popular for its lovely foliage and huge semi-single blossoms.

By crossing *R. sinica* with a Tea Rose J. C. SCHMIDT has given us *R. sinica Anemone*, a most beautiful variety with wonderful foliage, and doubtless this variety is capable of yielding other fine mildew-proof Roses by judicious crossing, which may also overcome the tenderness of the parents.

R. Brunonii should give us some good mildew-proof seedlings. We have a grand one in 'Miss Florence Mitten,' and it is another variety I would advise hybridists to utilize as seed parent.

R. multiflora or *polyantha*, although not addicted to mildew itself, seems to have been responsible for many badly mildewed Ramblers, so that one would be wise to avoid its use as a parent. The variety 'De la Grifferaie,' often used as a stock for climbing Tea and Noisette Roses, should find no place in our gardens, for in autumn it is white with the pest, and plants budded upon it should be avoided. I cannot help thinking such a stock has a deleterious effect upon the plant as far as encouraging mildew is concerned. A variety of *R. polyantha* named *grandiflora* might be the basis of some good mildew-proof Roses. Although it is generally known as of *polyantha* origin, the Kew authorities call it *Noisettiana grandiflora*, and I am inclined to think it is not, strictly speaking, a variety of *R. polyantha*.

A Noisette Rose, 'Aimée Vibert,' is such a splendid mildew-resisting variety that I would strongly recommend its use in hybridizing, especially with the Teas, so that we might obtain more perpetual-flowering mildew-proof climbers. There are two distinct forms of 'Aimée Vibert.' The one known as *scandens* being much more of a climbing habit than the other.

Herr PETER LAMBERT has crossed it with 'Crimson Rambler,' and we have as a result the variety 'Hauff,' of fine foliage and an almost perpetual bloomer, but with a very ugly-coloured flower.

'Claire Jacquier' seems to me to be a hybrid Noisette, and it is

so splendidly free of mildew that I think good results would follow if crossed with Tea Roses, probably giving us some perpetual-flowering mildew-resisting varieties. I have crossed it this year with the old 'Burghley Yellow,' and am looking forward to obtaining the long-wished-for Yellow Rambler. We raisers are always most optimistic in our work, and although we suffer many grievous disappointments, yet that does not diminish our ardour.

Our native Briar, *R. canina*, is a good mildew-resister, and we see in 'Una' what beautiful results might follow its use as a seed parent.

A fine mildew-proof Rose is *R. bracteata alba simplex*. There is a lovely Rose exhibited to-day by Messrs. W. Paul & Son, named 'Mermaid.' You will observe its beautiful glossy foliage, which is, I should say, quite mildew-proof. The raisers intimate its origin to be *R. bracteata* × Tea, I believe, or H. Tea. This may be the forerunner of many grand mildew-resisting varieties.

Some good species which I recommend for trial as a means of obtaining mildew-resisters are: *R. lucens*, *R. nitida*, *R. seraphina*, *R. albaica*, *R. Verbergi*, *R. glutinosa*, *R. microphylla*, *R. laxa*, *R. Souleii*, *R. Moyesii*. I am indebted to H. R. DARLINGTON, Esq., for these suggestions, and to W. WATSON, Esq., of Kew, for enabling me to show you some of them here to-day, and those interested will find them labelled before me.

Now, I have dealt largely with the Rambler class, and I take it we shall have no difficulty in obtaining mildew-resisting Roses sufficient for our needs from the various species and types mentioned. It is when we come to the more popular garden or decorative perpetual-blooming Roses that our difficulties increase, and I cannot hold out any hopes of a large increase to the mildew-resisting Roses so long as the present system of crossing Hybrid Teas with each other is carried on.

We see, for instance, the bad mildew trait of 'Mme. Abel Chatenay' perpetuated over and over again in her offspring, but she is such a fine flower, and has so many good points as a garden Rose, that hybridizers cannot resist the temptation to cross-fertilize this variety in order to obtain reds, yellows, and other shades of the same type of flower.

I have an idea, but I may be wrong, that much of the mildew trouble present among Hybrid Teas may be traced to the old 'Devoniensis,' a Rose that mildews badly. It was one of the parents that BENNETT employed to obtain his 'Lady Mary Fitzwilliam,' the other parent being 'Victor Verdier.' I believe 'Lady Mary Fitzwilliam' was one of the parents of 'Mme. Abel Chatenay.' It was also responsible on the pollen side for 'Margaret Dickson,' a terror for mildew, and 'Caroline Testout,' another culprit in this respect. 'Caroline Testout' bequeathed the tendency to mildew to 'Frau Karl Druschki,' and so we might go on, tracing back to the one origin in 'Devoniensis.'

Now when two mildew-proof Tea Roses, such as 'Papa Gontier' and 'Madame Hoste,' are crossed we obtain 'Lady Hillingdon,' which with me rarely mildews.

I have a firm belief that the crossing of the true Teas, such as 'Anna Ollivier,' 'Mme. Antoine Mari,' 'G. Nabonnand,' 'Rosomane Narcisse Thomas,' 'Sulphurea,' &c., which are in themselves mildew-proof, will give us some good mildew-proof Teas. On the other hand, I also advocate raising seedlings from some of these and other mildew-proof varieties without artificial crossing.

As far as we know, all of those just named were the result of self-fertilized seed, as were many of the old Teas now gone into oblivion. Some of the old French raisers were in the habit of fertilizing flowers with just any kind, adopting no method whatever. Even as recently as five years ago, I saw in a celebrated raiser's gardens at Lyons many hundreds of seedlings without any distinctive labels whatever, and I always have my doubts about the authenticity of the Continental crosses. At present my greatest hope in obtaining mildew-proof Roses is in the comparatively new group known as 'Pernetiana' Roses. This bids fair to be a most important group in the near future. We were somewhat disappointed at the behaviour of 'Rayon d'Or,' one of the first M. Pernet-Ducher gave us. It was the result of a cross between 'Mélanie Soupert' and a seedling from 'Soleil d'Or,' and the 'Lyon Rose' was from a similar cross.

Now, in 'Rayon d'Or' we have the true mildew-proof foliage, thick and glistening, and to this fine Rose we owe the introduction of 'Cissie Easlea,' one of the grandest Roses for foliage we have in our collection.

'Louise Catherine Breslau,' 'Constance,' 'Mrs. Wemyss Quin,' and 'Golden Emblem,' I take it, have the 'Rayon d'Or' blood in them. 'Golden Emblem' has glorious foliage, and will, I believe, equal 'Cissie Easlea' in this respect. Happily these Roses possess the more sturdy nature of the Hybrid Teas, and do not appear subject to the black-spot and dying-back of the wood as seen in 'Rayon d'Or.' Mr. COURTENAY PAGE has a fine golden seedling raised from 'Mélanie Soupert' \times 'Rayon d'Or,' which he has named 'Tim Page.' This has grand mildew-proof foliage.

I anticipate quite a number of advances in this direction, and if we can obtain longer petals and better form in crimsons, pinks, and whites they will largely displace the Hybrid Teas in the near future. I see no reason why crosses should not be effected between this group and the true Teas of the 'Madame Hoste' type, obtaining for us probably petals of greater length.

The China Teas, such as 'Comtesse du Cayla,' are another group worthy of the hybridist's attention, having in view mildew-proof Roses. The old common monthly would surely produce good things judiciously crossed, and I have proved that these semi-double and even single Roses often yield good double flowers aided by the hybridizer's art.

The *rugosa* Roses have long been eminent for their thick leathery foliage, but hitherto the results from crossing this group have not yielded very shapely flowers, although some grand decorative kinds have resulted. One kind, *R. rugosa* 'Georges Cain,' possesses such fine foliage and good deep petals that I strongly advise raisers to use it as a seed parent.

Another tribe, namely, the Hybrid Musks, seems to me capable of producing good mildew-proof Roses.

One kind, namely, 'Trier,' has been used, I believe, by the Rev. J. Pemberton as parent for some of his interesting novelties, such as 'Danaë,' 'Moonlight,' &c., although I have no authority for saying this.

'Trier' is mildew-proof, and was raised by Lambert from 'Aglaiä' × 'Mrs. Sharman Crawford.' Here we see the influence of the mildew-resisting seed parent 'Aglaiä' overpowering the badly-mildewed parent 'Mrs. Crawford.'

'Aglaiä' emanated from *R. polyantha* × 'Rêve d'Or,' both mildew-resisters.

'Trier' has produced 'Adrian Riverchon,' a fine single mildew-resister, and is capable, in my opinion, of giving us many very lovely perpetual-flowering mildew-proof shrub Roses, for we cannot term them Climbers or Ramblers.

In a paper on this subject one is handicapped by the reticence regarding parentage adopted by our Irish and other Rose-growers, and I could wish the task had been deputed to one of them to write it, for they could, if they would, throw much light upon the question of mildew-proof novelties, but I am convinced myself that in order to obtain more mildew-resisters we must start right with mildew-resisting kinds. And I cannot help saying that a trial garden should be established by the National Rose Society or the Royal Horticultural Society, where experiments could be carried out by capable raisers, who would be able to devote more time to the work than the grower for sale can possibly give.

We see this accomplished in a small way when we remember the results achieved by Dr. VAN FLEET in America and Dr. WILLIAMS of Harrow; and I wish, as the result of these somewhat disjointed remarks, I could induce other private gentlemen or ladies to take up the work, which is full of fascination and capable of wonderful results.

I append a list of certain varieties I have found to be more or less mildew-resisting. This list, taken from the "Rosarian's Year Book" of 1916, would take some time to read, and Fellows will be enabled to scrutinize it in the JOURNAL of this Society.

Perhaps before I sit down I might just say to any novice in Rose-growing that mildew is largely engendered by errors in cultivation, such as overdosing with chemical manures, watering with garden-hose, and soil too porous, all producing a softness of foliage that makes it a prey to the fungus.

Hybrid Teas.

Antoine Rivoire.
Charles de Lapisse.
Chrissie McKellar.
Clara Watson.
Colleen.
Dorothy Page Roberts.
Earl of Warwick.
Ecarlate.
Entente Cordiale.
Florence Forrester.
General McArthur.
Gloire Lyonnaise.
Joseph Hill.
Lady Battersca.
Lady Dunleath.
Lady Greenall.
Lady Pirrie.
Le Progrès.
Lieutenant Chauré.
Loeise Lilia.
Mabel Drew.
Marquise de Sinety.
Melody.
Mme. Charles Lutaud.
Mme. Edmée Metz.

Mme. Jules Bouché.
Mme. Wagram.
Mons. Paul Lédé.
Mrs. Aaron Ward.
Mrs. Arthur J. E. Coxhead.
Mrs. Arthur Munt.
Mrs. C. E. Allen.
Mrs. Edward Powell.
Mrs. Stewart Clark.
Mrs. T. Hillas.
Mrs. Wakefield Christie Miller.
Mrs. Wallace H. Rowe.
Natalie Bottner.
Old Gold.
Ophelia.
Peerless.
Rhea Reid.
Robin Hood.
Souvenir de E. Guillard.
Souvenir de Gustave Prat.
Souvenir de Marques Loureiro.
Theresa.
Triumph.
Walter Speed.
Warrior.

Pernetianas.

Arthur R. Goodwin.
Beauté de Lyon.
Cissie Easlea.
Constance.
Golden Emblem.

J. F. Barry.
Louise Catherine Breslau.
Mrs. Chas. E. Pearson.
Mrs. Wemyss Quin.
Rayon d'Or.

Teas.

Alexander Hill Gray.
Anna Ollivier.
Auguste Comte.
Betty Berkeley.
Comtesse Festetics Hamilton.
Corallina.
Freiherr von Marschall.
G. Nabonnand.
General Gallieni.
Homère.
Hugo Roller.
Jeanne Philippe.
Lady Plymouth.
Lady Roberts.
Madame Antoine Mari.
Madame Hoste.

Madame Jean Dupuy.
Maman Cochet.
Molly Sharman Crawford.
Mrs. Alfred Westmacott.
Mrs. R. B. Cant.
Mrs. Dudley Cross.
Mrs. Hubert Taylor.
Mrs. Sophia Neate.
Papa Gontier.
Paula.
Peace.
Rainbow.
Rosomane Narcisse Thomas.
Souvenir of Stella Gray.
White Maman Cochet.
W. R. Smith.

Chinas.

Comtesse du Cayla.
Mlle. de la Vallette.

Papa Hemeray.

Polyanthas.

Canarienvogel.
Cecile Brunner.
Echo.
Eugénie Lamesch.
Gruss an Aachen.
Kleiner Alfred.

Léonie Lamesch.
Orleans Rose.
Perle d'Or.
Rödhätte.
Tip-Top.
White Cecile Brunner.

Hybrid Musks.

| | |
|-----------------------|-----------------|
| Adrian Riverchon. | Moonlight. |
| Danaë. | Queen of Musks. |
| Daphne. | Trier. |
| Miss Florence Mitten. | |

Dwarf Wichuraianas.

| | |
|----------|----------------|
| Iceberg. | Yvonne Rabier. |
|----------|----------------|

Various Roses.

| | |
|-------------------|--------------------|
| Gottfried Keller. | Mrs. A. Kingsmill. |
| Irish Fireflame. | Sertata. |
| Louis Barbier. | Sinica. |
| Moyesii. | Una. |

Climbing Roses.

| | |
|-------------------------------|--------------------------------|
| Aimée Vibert. | Jean Guichard. |
| Aimée Vibert à Fleurs Jaunes. | Jersey Beauty. |
| Albéric Barbier. | Jessica. |
| American Pillar. | Joseph Billard. |
| Ariel. | Joseph Liger. |
| Aviateur Blériot. | Lady Waterlow. |
| Carmine Pillar. | Léontine Gervaise. |
| Château de Gros Bois. | Longworth Rambler. |
| Christine Wright. | Marie Henriette Gräfin Chotek. |
| Claire Jacquier. | Miss Helyett. |
| Climbing White Cochet. | Pink Pearl. |
| Désiré Bergera. | Polyantha grandiflora. |
| Dr. Van Fleet. | Renée Danielle. |
| Edmond Proust. | Reine Olga de Wurtemberg. |
| Effective. | Ruby Queen. |
| Evangeline. | Sanders White. |
| François Foucard. | Shower of Gold. |
| François Guillot. | Silver Moon. |
| François Juranville. | Sodenia. |
| Gardenia. | Source d'Or. |
| Gerbe Rose. | Sylvia. |
| Goldfinch. | Troubadour. |
| Inermis Morlettii. | Veilchenblau. |

THE LORETTE SYSTEM OF PRUNING
("LA TAILLE LORETTE").

By HERBERT E. DURHAM, Sc.D., &c.
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Horticulturists.

[Read July 31, 1917; Mr. E. A. BUNYARD, F.L.S., in the Chair.]

WHILST many methods of pruning have been advocated and practised, there is perhaps no one which is more based on physiological and botanical grounds than that propounded by Monsieur LOUIS LORETTE (Professeur d'Arboriculture, Chef de Pratique horticole à l'École de Wagnonville), Chevalier du Mérite agricole. The set purpose is to evoke growth of certain dormant eyes, whose productions are apt to possess great fruit-bearing proclivities, rather than simply to restrain extension of growth for cosmetic reasons. Besides attending to the actual production of fruit and the maintenance of prescribed forms, Lorette's system has one important character, which is not so much in evidence in many other styles of pruning, in that the tree is made to bear its fruit where it is most to be desired, namely, close to the supporting stems. A sharp distinction is to be made between the *supporting branch* ("branche charpentièrre ou charpente") and the *fruiting branchlet* ("branche coursonne")*; and the fruiting branchlets are kept very short, so that the fruit is borne as close as possible to the supporting branch—at any rate closer than is possible with the classic "three-eye system" ("taille trigemme"). In this country the ordinary bush and dwarf standard forms are usually a complexity, wherein neither definite support nor fruiting systems can be distinguished.

In Lorette's system the whole of the pruning is done during the period of active growth, commencing in the spring and finishing in September. Winter pruning is abolished, and the usual distinction of winter pruning for wood production and regulation, and of summer pruning for fruit production, also falls away; for it is found that a sufficiency of wood is formed without resort to cutting in the dormant period of the winter months.

In France some authors have named the system the "Taille courte d'été" or "Short Summer Pruning." This, I venture to think, is a misnomer, as two important sections of the work are dealt with in the spring and the early autumn respectively; so that the extended title, if indeed any is needed, should rather be "Spring-Summer-Autumn Pruning." Inasmuch as the operations are carried out

* The want of recognized terms in English for parts of fruit trees makes it somewhat difficult to write on the subject without quoting the *French equivalents*.

during months of more agreeable weather conditions than obtain during the winter months, I venture to quote a passage from "The Clergyman's Recreation," by JOHN LAURENCE, 1718, wherein this old writer contrasts the advantages of budding over pruning in the following words: "I prefer Inoculation, because it may be performed by any Gentleman himself with more pleasure and less danger to his Health. It requires no daubing with Clay, only a Penknife and a little woollen Yarn, which are both portable, and therefore always ready to be made use of, whenever his Meditation shall give way to his Pleasure. Besides this Operation is performed in Summer and warm Weather, when it is healthful as well as pleasant to be busied in a garden with some such little amusement. Whereas the Season of Grafting is in the Spring, when there is more of taking cold in a Nursery, where you must expect wet feet and dirty hands." Had he lived 200 years later, we can imagine that he would have expressed the same notions in regard to Lorette's methods; indeed, as will be seen immediately, he seems to have been near practising the method itself.

Lorette's original methods are applied not only to the Pear-tree with its commonly three-year period for fruit-blossom development, and to the Apple-tree with its usually two-year period, but also, as he informed me, to the Quince-tree with its one-year period. Moreover, the principle of only pruning during activity is applicable to the Gooseberry and Currant. Lastly, the Peach-tree (and perhaps one might presume all the *Prunus* tribe) is submitted to special practices which have been elaborated by this astute and industrious worker.

RETROSPECTIVE AND HISTORICAL.

It was towards the end of June 1914 (19th) that I paid an all too short visit to Monsieur LORETTE at his plantations at Wagnonville (near Douai, Nord) to see and to learn at headquarters more of the system than had already been observed previously in Champagne and Normandy. In his book* there were many obscure points requiring elucidation, and I would gladly have paid him another visit before venturing to appear before you to-day; but unfortunately that has not been possible, for since the early days of the war the place has been in the occupation of the Germans, and correspondence on the subject has likewise been interrupted. It is to be hoped that the trees and their master may be found to be uninjured when at last they are freed from the enemy. In his plantation at the time of my visit there were trees which had been pruned on M. LORETTE's ideas for eighteen years, no doubt with progressive modifications as time passed. Although some of my trees had been submitted to some extent to the system in 1913, it was only after my visit that I commenced in a more thorough manner on trees which now are in their fourth year of treatment.

Without any pretensions to having made an exhaustive search in

* *La Taille Lorette*, 1st ed. 1913, and 2nd ed. 1914. Versailles.

past writings I may call attention to the work of LAURENCE. "Now begin the Summer pruning of Pears, cutting off the shoots of this year that come forward to half an inch, taking out the rest in the middle entirely where they crowd one another: But at the extremities of the Tree, if there be room, they may be let alone to the winter pruning. (1) all perpendicular shoots in the middle of the Dwarfs, should this month be reduced to half an inch, that they may put forth weaker and bearing Branches . . . July.† The Pear-tree is now to be minded and disciplined too, if overvigorous, cutting off all Branches still that push forward to half an inch . . ." Also SWITZER ‡ emphasizes commencement of operations in April and early May, rather however for the direct purpose of removing blighted twigs, and replacing them with healthy ones, than with a set intention of getting bearing wood. Indeed, the whole idea of summer pinching may have been derived from endeavours to combat pests and their works; and there can be little doubt that the harder fully developed leaves are less liable to damage by aphides &c. than young and tender shoots.

The definite appreciation of the value of shoots derived from the normally latent stipulary eyes, which forms so important a feature in Lorette's procedure, is to be found in DU BREUIL.§ When the shoot has reached "un longueur de 5 cm. à 6 cm., on le coupera à la base, en conservant seulement son empâtement. Les deux boutons (yeux) stipulaires qui accompagnaient le bouton principale donneront lieu, presque immédiatement à deux petits bourgeons beaucoup moins forts que le bourgeon principale. On supprimera le plus vigoureux des deux, et celui que l'on conservera, et que l'on soumettra au pincement, si cela est nécessaire, donnera lieu à un petit rameau qui se mettra facilement à fruit." As we shall see, the chief shoot is cut back at a very much younger stage than in LORETTE's practice; indeed, in the fifteenth (current) edition of the work the lengths given are shorter still.||

In respect to the fruiting capacity of the growths from stipulary eyes, it is perhaps not entirely fanciful to think upon the Peach and Apricot where the stipulary eyes develop into blossoms whilst the central bud gives a wood shoot.

PEAR AND APPLE.

We may now turn more particularly to the practical side of our theme as it affects the Pear-tree and the Apple-tree. Pruning may be classified into two categories: (1) that needed for forming or shaping, and (2) that for maintaining the form or shape and the productivity. It will be convenient to take the latter first, and also to deal with the conversion from classic methods to this novel system.

* *Op. cit. supra*, 1718, pp. 71 et seq.

† *The Practical Fruit Gardener*, 1724.

‡ *Instructions élémentaires sur la Conduite des Arbres fruitiers*, Paris, 2nd ed. 1857, p. 57. I have not the first edition.

|| p. 112, 4 cm. to 5 cm.

† p. 84.

Lorette pruning for maintenance. (1) Treatment of leading shoot or leader. This is the first operation of the year, and is undertaken in April, mid or late, indeed even in May, according to the situation, season, and soil. In any case, the Apple will be ready much later than the Pear. The criterion whereby the proper time is judged is the growth of side shoots from the pre-existent eyes to a length of about a couple of inches; this shows that the sap is rising well. If the tree is still being trained and has not yet reached its full designed height, LORETTE only pinches away the top few buds in cases where the tree is well sunned and exposed to the air; on the other hand, if it is not so favourably situate, and is shaded, a quarter or half may be removed, for the eyes are not so full of vigour, and there is little risk of engendering the growth of numerous premature shoots. The object is to get the majority of the eyes to become "dards" at once. Here I may say that much depends upon the local habit of the variety; in the soil of Herefordshire, such long pruning in fully exposed prolongations almost always fails to cause some nine or ten eyes to break, with the result that some 12 or 14 inches of bare wood with dormant eyes ensues, and is possibly the cause of so much unfurnished bare wood in plantations in the county. Perhaps ten or a dozen buds may be enough to leave, unless "notching" ("entaille" *) is made to awaken sleepers.

If, on the other hand, the tree has attained the desired proportions, the leader is cut back to about $\frac{1}{2}$ or $\frac{3}{8}$ inch above its base ("sur empiement"). Several thin shoots will arise, and these are not interfered with. (See later.)

(2) Treatment of fruiting branchlets ("coursonnes"). The objects in view are to keep the fruit branchlets as short as possible so that the fruit may be borne as close as possible to the supporting branch, to evoke the formations from stipulary eyes and so produce new fruit buds to replace old ones. These branchlets may be fertile when they will mostly give rise to some wood shoots, which will be the only formation on sterile ones. The criterion for judging when these shoots are ready for cutting is a semilignous condition at the base: they are somewhat woody, but somewhat juicy withal. The proper moment is indicated by the physiological condition rather than by a particular date or a precise diameter or length attained. In his book, LORETTE constantly speaks of performing on a shoot when it has reached the thickness of an ordinary pencil (about $\frac{1}{4}$ inch). However, he told me that this guide was rather to be regarded in training operations than in general maintenance, and it will be patent that much will depend upon the habit of the variety under the hand. On a tree in full bearing and on open site, the shoots will be about 10 to 12 inches in length,† as in the pruning I witnessed at Wagnonville, when perhaps none of the shoots removed was really of pencil-thickness. Where vegetation is still predominant and also in over-crowded or shaded parts of the tree, rather a greater length will

* See appendix for definition of terms.

† On a slow-growing variety like D'Arcy Spice 6-8 in. will be long enough.

form an index. The shoot should have become distinctly woody, and still be distinctly juicy at the site of the cut, at any rate in the case of the Pear; in the Apple, the shoots are of a drier quality.

At some time between the later days of May and the middle of June the shoots will be ready for pruning; some writers tend to fix June 15 as the date for commencement. Naturally the position of the trees will make a considerable effect on their progress; thus if they are "*en espalier*"—that is, trained against a wall or paling—they will be ready earlier than those grown in the open.

The upper half or third of the tree should be dealt with first, the lower parts perhaps a week or so later; this instruction is based upon the physiological ground of favouring the lower parts and sheltering them from denudation; it is most important when conversion to the method is being adopted.

It may be noted here that a considerable number of varieties have been tried and found to respond satisfactorily, so that the system is apparently applicable to any kind.

The treatment which is to be meted out to each shoot will depend upon its anatomical constitution. In order to explain this I must digress for a moment to consider the organs involved, and particularly their names; unfortunately we have not so good a vocabulary as the French for these things.

The ordinary "*eye*" or bud on the course of a shoot is a small blunt body, sometimes somewhat flattened and situate in the angle of attachment or axil of the leaf-stalk. The eye may break to form a wood shoot, of which several sorts are to be distinguished, or to form a fruiting organ (blossom or fruit-bud, "*bouton à fruit*"), or lastly it may remain dormant either permanently or until some stimulus is given to bring its vitality into an active phase. In the development of the fruit-bud, the first stage is known in France as a "*dard*" (pronounced *dar*, meaning a lance or dart from its sharp-pointed terminal bud when dormant); then the eye which produces it, instead of bursting into a shoot, may only grow out perhaps a quarter of an inch or less with a terminal conical bud, and generally three small leaves; next season, without much wood growth, the leaves increase to four or five, whilst the stem may begin to show grooving of the bark ("*rides*"); it may also make rather longer growth, when it is known as a long "*dard*" of 2, 3, or even 4 inches in length; beyond which it passes to the "*brindille couronnée*" or end-fruiting twig. In further growth it acquires five, six, or more leaves, clustered around its short stem, which is surmounted by a more rounded, fatter terminal bud—the fully formed fruit-bud; when it has arrived at this stage it is safely fixed in character, but in the earlier "*dard*" stage, if too much sap is directed thither it may grow out and become merely a wood shoot. The art of the fruit-grower is invoked to cause a sufficient run of sap to it for its sturdy and rapid development into a fruiting organ, and to avoid losing it from putting on too much pressure.

On each side of the principal eye, which is readily seen, there exists

another eye—the pair of stipulary eyes (“yeux stipulaires ou sous-yeux”), which can be awakened into activity; usually they remain dormant though still existing at the base or heel of the shoot. If we examine a vigorous shoot, it will be seen that the first few leaves are attached close about its base, and are four, five, or six in number; they form a little cluster like those about the fruit-bud, and we call them the Basal Cluster. In less sturdy shoots the cluster is reduced perhaps to three leaves, whilst in crowded regions, and especially on secondary or premature shoots (“bourgeons anticipés”), the arrangement may not be apparent. On further examination it will be seen that there are no apparent eyes in their axils; in French they are often called “folioles” in consequence; generally they are smaller than the other leaves, especially the lowermost, which is often cast off early. These basal leaves are important as they nourish the “invisible” buds at their axils, and these buds are wanted in LORETTE’S system to produce fresh dards. Normally these leaves are implanted on a length of about $\frac{1}{2}$ to $\frac{3}{4}$ inch, so that cutting back to this length leaves them intact, but removes all the leaves which have visible eyes. This cut is called the “taille sur empâtement,” as an English equivalent to which I propose the phrase “Cut to the basal cluster.”

Another structure to which reference must be made is the “bourse” of the French; J. LAURENCE called this the “knob” about two hundred years ago, and I think that we may adopt his term for it, as we have none other. It is a somewhat fleshy thickening, especially in the Pear-tree, of a spur which bore fruit in the previous season, and is a fertile source of dards, though it also may give rise to wood-shoots. A cutting instrument will be needed, and the single curved sécateur is the most convenient; with a knife or parrot-beak shears the work is slower, because so much care has to be taken to avoid injuring leaves, especially those of the *basal cluster*. Since further growth in line is not needed, there is no cause for oblique cuts; moreover, it will be seen that further shortening may be done on the branchlet before the season is over.

After these introductory remarks we are in a position to proceed with the pruning of June (or May/June). There are three possibilities in the constitution of a shoot at or about its base.

1. There may be a fully-formed blossom bud.
2. There may be a “dard” (fig. 36).
3. Or there may be no sign of a fruiting organ.

In the first two cases, the shoot is cut back to leave one leaf with an apparent eye; the sap drawn by the basal cluster and the one other leaf is enough to throw in sufficient sap for either fruit-bud or dard, and not make the latter break. Where there is no fruiting organ the cut is made to the basal cluster to throw more sap back into the dormant eyes and cause them to make dards; where there is no definite cluster the base of the shoot is weak, and it is better either to remove it entirely, or leave two or three leaves if it is wanted. In the course

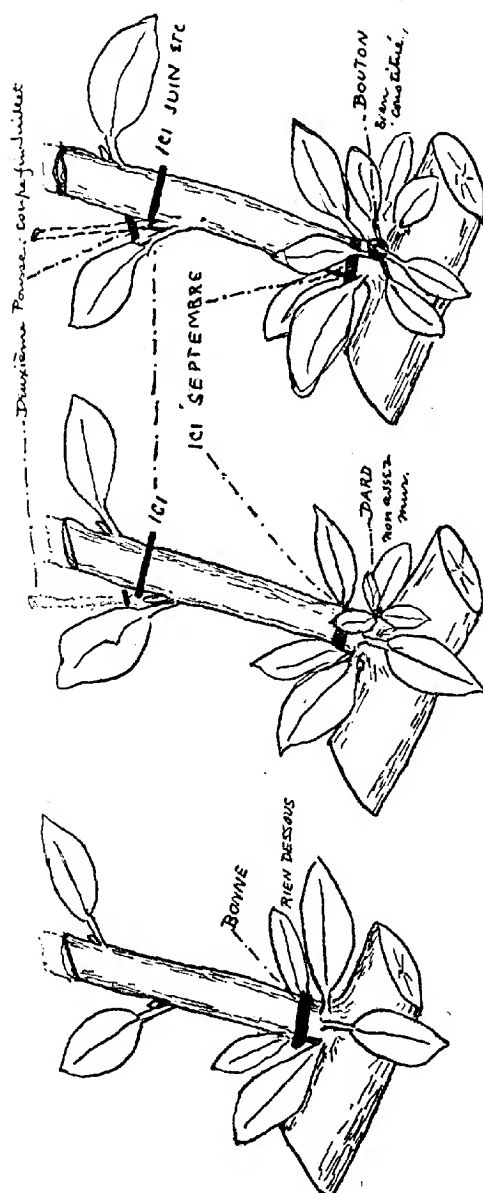


FIG. 36.—Copy of rough diagram submitted to M. Lorette, in July 1914, and marked and annotated by him. In many cases on converted trees there will be a distinct space between the support branch and the "dard" or fruit bud, and the basal cluster of leaves of course absent. The black bars indicate where transverse cuts are made at the times shown.

of events from the concentration of sap the basal cluster region often becomes swollen and looks much like a "knob," and with the increased nourishment one or more dards may make their appearance.

At this pruning it is well to give special attention to the "knobs" on which any single wood-shoot should be cut back to basal leaves, *although there will probably be dards or fruit-buds at their apparent bases*; if there should be many such shoots on a knob, the least vigorous is left with a couple of eyed-leaves, while the rest are completely removed; otherwise too much crowding will ensue.

Besides there will be a number of shoots which have not yet acquired sufficient size and consistence; these will be left to wait till next month, and are dealt with in the July (or July/August) pruning, when they, as well as any other shoots that have become sufficiently ripened, are dealt with on the lines that have already been laid down. Attention must be given to secondary shoots if any are sufficiently woody; they are removed with care to preserve the leaf whose bud gave them origin. Also, heed must be given lest side-shoots should rob the leader. Some writers apparently leave this pruning aside and await the August (or August/September) pruning, which is only a repetition of the process as regards both new shoots and secondary shoots. LORETTE regards the August pruning as one of great importance, for the sap is thickening and slackening; so that if the season be a wet one, the pruning should be delayed, but if dry and hot, it may be begun early in the month.

September pruning brings the treatment to its end for the season, so that when finished the trees are not touched with the sécateurs till the following spring.*

First of all, there will be a number of shoots to cut back to their basal clusters, and as growth has practically ceased no distinction is to be made between them, excepting only thin twiggy ones known as "brindilles." These may be left, but care must be taken not to retain too many, for they easily cause overcrowding. Those that are kept are best bent or bowed downwards ("down-bend") (fig. 37) to favour the formation of fruit-buds on them. This occurs naturally if a fruit is borne at the end ("brindille couronnée"). For the rest a general clearance is done, and wherever a good fruit-bud has formed the cut is made right back to it, otherwise the cut is "sur empatement."† The fruit-bud, with five or six leaves in its cluster and some sign of cross-fissuring of its back, is fixed and will not turn into a wood-shoot. In M. LORETTE's words (private correspondence, July 1914): "Suppres-

* There is one small exception to this, as thinning of compound spurs is advised for November; five fruit buds should be left, and not only one or two as some writers recommend. Certainly the thinning out of spurs even to two or three on old trees seems to have a favourable effect.

† Note, July 1918. The cut back to a fruiting organ in September seemed quite a novel procedure. However, I find that J. J. Thomas (*The American Fruit Culturist*, New York, 1867, p. 240) recommends stopping or pinching of side shoots during the summer, and in conclusion writes: "Early in autumn the shortened shoots are to be cut down, leaving the fruit-buds, only, to bear the next season. By this regularity of pruning, the tree will preserve a neat appearance, and bear regular crops."



FIG. 37.—BRISTLES, OR TULGEY STIGOTS, ON WHICH THE 'DOWN-BAND' HAS BEEN DONE.



FIG. 38.—EARLY FIRST STAGE OF U OR DOUBLED U FROM SEPTUARY BUDS.

FIG. 37.—The upper one is in its second year, kept for demonstration, intact; the other is a last year's twig. Both are furnished with darts, or blossom buds all the way along. In September these would be cut back to one or two blossom buds according to length; these have been left for the nonce as demonstration specimens.

FIG. 38.—On the right a bud is seen just shooting, on the left a roughness can be seen where the other bud is starting to break. Some basal cluster leaves were left, and two of them buds started but were rubbed out, the leaves were left to draw sap. (Rosemary Kusset.)

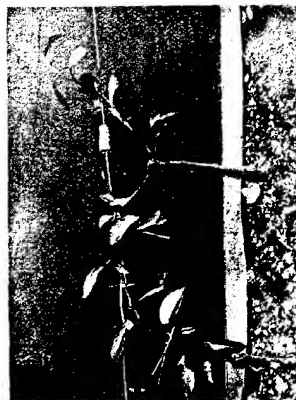


FIG. 39. LATER FIRST STAGE OF U OR DOUBLED U FROM STRUCK-LAY EYES. (Cf. fig. 38.)

The left-hand shoot is tied down, subsequently the leaves were also snipped to get equilibrium (U ear, fig. 39 upper). The cork on the wire is perforated and split and forms a node of preventing contact of wire and branch in tying up; canes or bails are tied on vertically for guiding and supporting the branches.

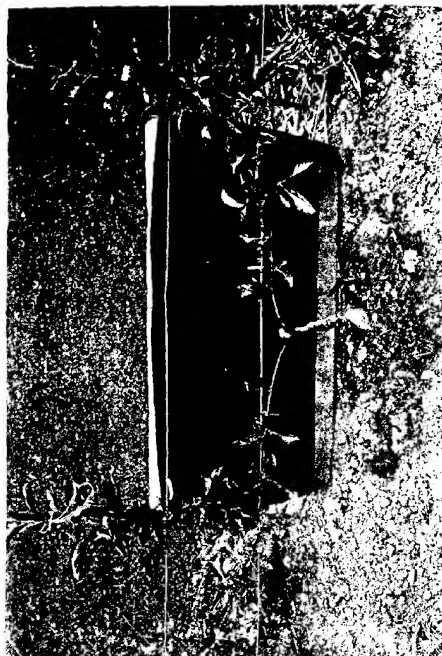


FIG. 40. FINAL STAGE OF U OR FIRST STAGE OF DOUBLED U COMPLETED (ROBUSTON TYPE)
For distance of branches see text.



FIG. 41.—TO SHOW EFFECT OF OBTAINING BRANCHES CLOSELY NEAR THE SAME LEVEL. (See text.)



FIG. 42.—PEAR BLOSSOM AFTER FOURTH SEASON OF LOREITE PRUNING (OLIVIER DE SERRES ON LEFT, AND D. DU COMICE ON RIGHT).

These and other trees on the wall will be replaced with the more up-to-date Doubled U form.



FIG. 43.—RED CURRANT ('COMET') IN BLOSSOM AFTER TWO YEARS' LORETTE PRUNING.



FIG. 44.—GOOSEBERRY IN FRUIT AFTER TWO YEARS' LORETTE PRUNING.

The end spray has 28, the previous year section 29, and the year before that 19, but this is crowded at the base of the bush. I may note that the lozenge-trained hedge of M. Lorette (p. 199) was crowded with fruit all the way up when I saw it, similarly to this photograph.

[To face p. 29.]

sion de toute la partie ayant servie d'appel sève première quinzaine de Septembre, c'est à dire qu'à cette époque on doit tailler sur le bouton bien constitué." The illustration, which is copied from a rough sketch submitted to and annotated by M. LORETTE, will make the matter clear. Thus, when the pruning is completed, there only remain fruit-buds, basal cluster stumps with or without dards at their bases, and some fine twigs. The leading shoots remain untouched till the following April if the tree is incompletely ; but if full size has been attained they may now be shortened to 5 or 6 inches to prevent damage by wind during the winter, and cut "sur empâtement," that is to about $\frac{1}{4}$ or $\frac{3}{4}$ inch in the spring.

If we look at an old standard tree which has not been subjected to pruning, we find that its leafage consists almost entirely of basal cluster leaves on its numerous fruit-spurs, with here and there a wood-shoot or two. The condition of a tree which has been Loretted is in much the same condition ; its nourishment is largely dependent, indeed almost entirely, upon leaves of the basal cluster with the aid of those of the shoots which are not yet mature in the earlier prunings and of the twigs at the final pruning.

Modifications have already been introduced by various writers, some of whom fear to give up winter pruning entirely.

Personally, I do not adhere to getting all the pruning done at a more or less stated time. Where the ladder is required, the upper parts of the trees are fairly well cleaned up, but where one can reach from the ground I rather ramble around at any odd time and then deal with such shoots as may seem to require treatment. Difficulties may arise—or should I say judgment is sometimes required?—where trees are irregular and not standardized, as also in the balance of the upper and lower parts of the trees. Where doubt exists, it is perhaps safer to cut here and there only two or three leaves, when sap-drawers seem scanty or where the check of too much luxuriance might provoke too great a flow of sap where it is not required. In such cases, when, say, two secondary shoots have appeared, I cut the main shoot above the lower secondary. The white mildew is apt to denude a shoot except for its terminal leaves and the basal cluster, then possibly it is as well to cut to the basal cluster, and one ought to dip the sécateurs occasionally in Lysol or some other lotion, at any rate before proceeding to another tree ; but I fear it is not often done. The treatment of the twiggy shoot ("brindille") will also give cause for thought. I have not tried the transfixion method,* in which the "downbend" is combined with piercing the stem between the third and fourth leaves with a budding knife.

Too early pruning rather tends to set back and delay growth, whilst if thorough woodiness has developed, the desired accessory growths do not appear so satisfactorily as when the condition of the shoot is just right ; on the whole, I fancy it is better to be rather too early than too late on fully formed trees.

* Lorette, p. 177.

One objection that has been raised is that the method could not be adopted for commercial growth on the large scale, because so much time would be needed when other matters, picking &c., must be done. COUTANT reports that he commenced in 1913, after a year's trial on a small scale in 1912, to treat 20,000 trees on Lorette's system, that is to say two-fifths of his trees; though no doubt the war has interrupted the progress of this large scale trial, its inception shows what a Frenchman thinks possible with their alert workers, when a lad of seventeen years may be entrusted with the pruning of a couple of thousand Pear-trees.

Once training of stipulary shoots has been commenced, the tree should not be moved until the training is completed. I say so from experience of one in which the direction of stipulary shoots from another eye than that originally designed was rectified by careful transplantation, and at least a year was lost. There is tendency to form fruit blossoms instead of wood shoots, and the tree has to be wheedled back into growth.

CONVERSION FROM FORMER METHODS TO LORETTE'S SYSTEM.

Lorette considers that the interval of 30 cm. is too short to be allowable between main support branches, consequently these are to be cleared out so as to leave about 15 inches (40 cm.) or more in the case of 9 or 10 ft. pyramids. First of all, the tree must be left without any winter pruning; in the spring, superfluous structural branches are cleared out. In shortening the side branchlets, in conversation, M. LORETTE was very insistent on never leaving less than about 4 or 5 inches. After this cutting back, those new shoots which have become woody and as thick as a pencil are removed, whilst the weaker ones are cut back to three good eyes; this will be done about the end of May (Pears) over the upper part of the tree, and two or three weeks later, in June, over the lower part. In July, if two shoots have grown from two eyes having broken, the end one is removed and the lower one cut back below leaves with apparent eyes, given that a length of 9 or 10 inches has been attained. Personally I have been rather conservative and cut back side branches hard where there was no prospective fruit, and leaving parts with existing fruit to a certain extent for another season; my plan has been to avoid too much hurry in the conversion, and to use the "taille sur rides" in subsequent seasons, cutting to old fissured or wrinkled bark in May or June (Pears), up to August (Apples). The shock produced on a tree seems much less when heavy cutting is done in May onwards than when it is done in the winter. Having once made a good start, the subsequent procedure is as has already been outlined.

TRAINING PRINCIPLES.

Three main guiding features are insisted upon: (1) The distancing of support branches, (2) the use of shoots derived from stipulary

eyes, and (3) following from the latter, all pruning is done during active growth.

(1) *Distancing*.—Most writers on training only speak of or allow a distance of about a foot between main branches; thus the main boughs of a doubled U or of a horizontal palmette are put at 30 cm. in French and one foot in English works. LORETTE considers that it is important not to go below the minimum of 40 cm. (15½ inches) for trees trained in the flat, whether in espalier or counter-espalier (*i.e.* against a wall or on supports in the open), whilst for pyramids, cones, &c., the distance advised is even greater (45 to 50 cm., or 17·7 to 19·7 inches). The intention is to give plenty of space, light, and air, and so to encourage fruit-production with avoidance of basal denudation. Moreover, he would limit the total length of support branches on a tree to a maximum of 20 mètres (65 feet); thus with a horizontal palmette of four tiers the length of branches would be about 7½ feet; whilst a higher tree with ten pairs of branches would give a length of 2½ feet for each branch. I am disposed to think that a limitation on these lines is probably good from examples with long side branches with which I have had to deal; incidentally, the higher trees are then much more readily got at with the ladder; the long extensions, sometimes formed to fill spaces far from the main trunk, tend to lead to denudation at the base.

(2) *Stipulary eyes*.—In order to evoke the stipulary eyes it is needful, first of all, to cut back in April/May the leading or other shoot of last year just above the eye where the new shoots are required. The end bud will break and give forth a shoot (figs. 38, 39, 40). When this has attained pencil thickness and is thoroughly vigorous, but not fully lignified, it is cut back, a short stump only being left. On either side, at the base of this stump, the stipulary eyes shoot forth; one however precedes the other, so that if both are wanted, as in forming a "doubled U" or a horizontal or Verrier palmette, they must be equalized by tying down the first and more sturdy one until the other has caught it up; it is rarely necessary to snip the leaves also, whilst another aid, if needed, is to make longitudinal incision through the bark of the weaker shoot in the following March. It will be seen that the two boughs come off at precisely the same level, so that once equalized there is no difficulty in maintaining equilibrium once it has been established; this is not the case when naturally occurring branches have been utilized for making so-called pairs. I need say no more in advocacy of this great improvement in technique, which indeed must be much less costly to install.

If the central stem is required, as in a Verrier or a horizontal palmette, two buds are allowed to break, the lower one being placed in front and at the level for the first pair of branches, whilst the upper one may have any direction; the two shoots at the lower eye are equalized for the first pair of branches, whilst of the upper pair only the second or weaker one is retained to continue the central trunk. In order to get the next pair of shoots in proper direction, this shoot

is twisted so as to bring an eye forward at the proper level, wherewith to develop the second pair of branches, and so on for further development. It may be asked, Why not allow the mid-stem to grow on naturally? the reply to which is that the central stem must be checked to allow thorough development of the lower tiers before it is allowed to proceed, otherwise basal denudation is sure to occur; the procedure also has the advantage of getting the more productive (as is claimed, stipulary wood for the continuation. I may add here that LORETTE advises the use of the weaker or second stipulary shoot for obtaining the main stem of the simple cordon and also for the main branches of the dwarf distaffs or "fuseaux." It will be noted that in many of these forms the eventual support branches are "doubly stipularized," if one may coin the phrase, as for instance is the case with the "doubled U." It is important that the maiden tree should be thoroughly well rooted before commencing operations, and if, as I usually find, growth is not good in the spring following plantation, it is better to await the next April, or more time may be lost. At planting the maiden, LORETTE advises a mere removal of the top few eyes: I am not sure whether it is not best to leave all alone. Where straight continuations are needed the pruning cuts should be made obliquely; if only a U-form is being made the cut should be transverse for preference. In some cases M. LORETTE was developing his stipularies from a lower eye, as if a continuation was wanted, but the upper part was to be cut away, and was merely retained as a sap drawer ("appel sève"); in the same way some shooting may be allowed below the chosen eye to draw sap for awhile; these variations may be useful where growth is not strong enough, as I find often to be the case where maidens have not been planted for a good year. At any rate, in one case I have obtained direct growth of stipularies in a tree in its third year; two sets broke without the central shoot. There is, of course, the risk that the eyes may have received damage without the protecting shoot base.

In these procedures only pairs of branches can be obtained, but sometimes one wants more branches at or close about one level, as in a "staged pyramid," for the natural branches are always so separated that the upper ones will always cause trouble and delay in securing an equilibrium, which indeed is never final. Curiously enough, LORETTE does not write of this in his book, and I cannot be sure in what author I found the procedure. The leading shoot is cut back to an eye at a level slightly below the point at which the branching is desired, the pruning cut being oblique to allow prolongation in line (fig. 41). When the shoot from the terminal eye is ready, and has a good basal cluster of leaves, it is cut back to one or two apparent eyes; when these have shot well, a transverse cut is made to the basal cluster. The first cutting yields the basal cluster, the second throws nourishing sap into the latent eyes of the basal cluster leaves, and the third one causes them to shoot; in this way one can obtain some five to seven shoots originating almost at one level, anyhow more so than can be done in any other way except by the insertion of grafts or

buds. A single cutting straight back to the basal cluster may sometimes succeed. One shoot may be guided upward for the continuation and others selected for retention and equalization as may be required. Botanically, of course, the leaves are not exactly at the same level, for they do not form a "whorl."

Results.—Of the results obtained by these pruning methods in M. LORETTE's plantations there could be no question, and the figures in his book were no exaggeration of the prodigious fruiting of the trees when I saw them. The two old pyramids,* one of which had been submitted to the "Taille Lorette," were perhaps the most striking of all (fig. 42). From tentative operations on a few trees I have passed to treating practically all my available trees on the method, and am in course of training others. Other writers, as COUTANT and MOSER, have expressed their contentment; the former is treating 20,000 trees on the plan. All that one need say is: "Make trial on a few trees, and if all seems good, do more." It is particularly on trees that refuse to fruit, blossom, or that have a habit of taking holiday seasons, that trial may especially be suggested. Even if the whole scheme be not entertained, the application of the basal cluster cut is worth trial for gross wood shoots ("gourmands"), and is less work than the implantation of blossom buds. M. LORETTE told me that about a quarter of an hour was needed to trim one of his full-sized winged pyramids. In irregular growths such as are so common, bush and ill-trained dwarf standards, the pruning will be somewhat lengthy, if indeed practicable, until some law and order has been established. Certainly the development of dard and fruit-buds seems to follow the descriptions; and it may be observed how like a bourse or knob is the swollen basal part of a shoot after the cut to the basal cluster. I have already noted that practically any variety of Apple or Pear seems to be amenable to the system.

Quince Tree.—Of this I hardly like to say much, as I have been working rather in the dark upon three young cordons "en espalier" without any definite instructions from the master. The Quince bears on new wood and the shoots are devoid of a "basal cluster." The shoots when about 12 to 18 inches long have been taken back to the first or second leaf; where bifurcations occur the nearest shoot to the main stem has alone been left. Where cuttings are needed to prevent overcrowding and to let in light and air, a sap sucker is left until basal shoots develop. Blossoming has been good and free, but white mildew has caused a good deal of promise to "miff off" in an unpleasant manner. Repeated "lime sulphur" wash at 1 per hundred has perhaps saved the half-dozen fruits that have apparently become well set this season. My hope is to establish cluster blooms, like the "Bouquets de Mai" of the Peach, Plum, and Cherry; as also occur on *Cydonia japonica*.

Peach Tree.—Of these I have no personal experience beyond the inspection of M. LORETTE's trees, which certainly demonstrated his

* *Vide* 2nd ed. p. 105.

contentions. Here side by side were trees on the 'classic and on his system of treatment. In a few words he suppresses summer pinching entirely, and controls by snipping off some half to two-thirds of each leaf on the basal parts of the shoots (say about 12 to 20 or more inches) which are destined to bear next year. The tendency of premature development of secondary shoots is thereby prevented, and the formation of *cluster blossoms* ("Bouquets de Mai") is favoured. It may be noted that leaf-snipping on a less extensive scale is mentioned by DU BREUIL. The formation of these cluster blooms is particularly desired by our friends across the Channel, and I have intended to treat a Morello Cherry on these lines, in the hope of getting it well furnished with bouquets and thereby reducing the labours upon it, but so far the intention has not been carried out. It will be noted that pinching tends to throw sap into the basal eyes and so provoke premature shootings. The two effects, namely, inhibition of the formation of premature wood shoots and abundance of blossom bunches which had formed fruit, were well shown on his trees. Inspection of old and unpruned Plum or Cherry trees shows that practically all the blossom is in the cluster form, and if these can be artificially favoured less work may be entailed for continued fruit production.

Gooseberries and Red Currants.—Usually these are pruned after the fall of the leaf. LORETTE's plan, which I understand is sometimes practised in this country, is to do the annual pruning in the green directly after the crop is off, or if picked green when it would have ripened. This pruning, towards the end of July or early in August, tends to throw sap into the buds for next year's crop. The plants which I have treated are mostly "en espalier" on an east wall, and the plan adopted has been to pinch or break off all sturdy shoots when four leaves have become fully developed or six on weaker ones (excepting thin twiggy ones which are left); in July/August all side shoots are cut so as to leave one, or at most two, leaves; LORETTE puts it at "a few eyes." In this way the thorns disappear as the wood gets old, and yet the buds continue to produce. The figures show that two years of this treatment have not depleted the bushes, fig. 43 shows the blossom on Red Currant "Comet," and fig. 44 shows fruit on Gooseberry "Telegraph." When training Gooseberries, it is important not to let subterminal shoots rob that which is the main leader—at any rate if indiscriminate forkings and branchings are to be avoided. The Black Currant might also receive its orthodox pruning about the same time.

Conclusion.—Whilst, generally, summer treatments are of value in a more or less subsidiary way, in that the trees are well looked over, and consequently any disorder or pest is likely to be observed. LORETTE's methods, in which the visits are more frequently repeated and the trees thoroughly inspected each time, give an enhanced position for this point in fruit-growing.

Finally, I feel sure that you will all be full of hope that Monsieur

LORETTE and his daughter have been spared to carry on their work, and that their beloved plantations, which they have tended for so many years, will still remain as a monument to the Professor's industry and acumen. Situated as it is, just outside the suburban area of Douai, one can but fear the worst has or will happen to the trees.

APPENDIX.

Note on Nomenclature of Fruit-tree Parts.

In the English language there is no comprehensive vocabulary for the different parts of the various fruit-trees. True, we have the word 'spur,' but that is not very definite, and is applied to somewhat varying structures from the simple "lambourde," a single short branch terminated in a single bloom-bud, the multiple "lambourde," which has arisen from branching and forking of the "bourse" area of the simple form, to the clusters of fruit-buds on Cherry or Currant. For instance, in "The Fruit-growers' Guide" by J. WRIGHT (recent; Virtue & Co.), about the only distinction of parts given is a "short stubby shoot," which from the figure apparently betokens a long "dard"; of the important organ the "bourse" there is apparently no mention, not to mention other parts. I called attention* to this want of terms in the hope of arousing suggestions for an authoritative set of terms. "A New English Dictionary" by MURRAY and others and LITTRÉ's French dictionary have been consulted for the following notes:

Basal cluster of leaves on a shoot.—*Cluster*: "things of the same kind growing close together, e.g. fruits or flowers . . . originally of grapes, for which the word bunch is now common." As an alternative "Rosette" has been suggested, but "(a) a cluster of organs or parts resembling a rose in form or arrangement, (b) cluster of leaves naturally disposed like petals of a rose . . . 1848. 'Scions short, terminating in a rosette of leaves,'" show that the continuation centrally of the shoot makes the term inapplicable.

Bourse.—Except for the use of "purse" as equivalent in WARDER's translation of one of DU BREUIL's works, and which does not seem very satisfactory, apparently the only one of English authors who have recognized the organ is J. LAURENCE,† who calls it a *knob*; I suggest that this word be re-established.

Coursonne (f.), *courson* (m.).—"Branche taillée courte par opposition à d'autres taillées longues; . . . bois qu'on taille tous les ans sur les branches charpentes de la vigne, et qui porte le produit de la bourre ou œil. Branches coursonnes, sur le pêcher, celles qui, placées sur la charpente, portent la branche à fruit de l'année," that is, those which have been pruned short. In books on fruit culture the word is used for fruiting branches of other sorts as well as vine and peach, which

* *Gardeners' Chronicle*, December 1914, p. 395, and again February 1915, p. 71, and July 1916, p. 14.

† *The Clergyman's Recreation &c.* 1716. *Vide also Gardeners' Chronicle*, July 6, 1916, p. 14—200 years later!

are intended to be given up to fruiting only, and which are pruned accordingly. LORETTE* uses the word in an unusual sense for buds not shortened artificially, and his figure 41 represents what other authors † call a "rameau à fruits" as opposed to a "r. à bois"; this author uses the phrase "branche à fruits" instead of "coursonne," whilst DU BREUIL ‡ uses "rameau" both for fruiting and plain shoots. In the foregoing essay I have used the words "fruiting branchlet."

Bouquet de Mai ("branche à bouquet") literally signifies one of the bunches of flowers on the Mai or Maypole. Cluster-blossoms, and clustered or bunched blossoms, or bloom-buds, give the meaning, but not the poetical finish of the French term.

Dard (pronounced "dar").—"Petit rameau du poirier d'un centimètre à 5-8 de longueur terminé par un œil conique, qui finit par s'arrondir et devenir bouton à fruits." In derivation a *dart* or *lance*, apparently from its sharp-pointed bud when dormant. For this an English equivalent is badly needed, and in the above essay I have used the word as it stands; if we introduce it as a legitimized term, even with pronouncing the final *d*, it would perhaps be better than the word *dart*. Recently a writer in "The Fruit-Grower" was evidently in trouble from the want of this word which expresses the prospective but immature fruit-bud, without circumlocution. *Entaille* (or *cran*) is another useful word, meaning the removal of a small piece of bark, which might be rendered "notch"; qualified as high or low, according to whether the sap-flow to a given bud was to be favoured or diminished.

Taille sur rides is much insisted upon by COUTANT§ and consists rather of a cut among the furrows or groovings of old wood of "coursannes" rather than *to* them, whereby small adventitious eyes are made to break into dards. HARDY|| gives May and June as the time for the operation in Pears, and May to August in Apples. COUTANT does this pruning in furrows shorter and more severely on Apples than on Pears: "De nombreux yeux se sont développés à la base ainsi que des dards très bien constitués, ce qui fournira de véritables nids de fruits. J'insiste sur cette taille sur rides, qui donne des résultats merveilleux." It may be noted that the cut is made transversely.

Arcure and *Bouclage*.—Words for the bowing or bending down used by various authors, including LORETTE, especially for the twiggy branches or brindilles, might be taken from derivatives of *arch*, but for confusion with *inarch*, or of *bow*. But who would know how to pronounce it? *Buckle* is used rather of local bendings of plates which are said to be "in winding"; perhaps a compound word such as the "*down-bend*" would do to mark the distinct meaning without circumlocutory phrasing. Some other questions of ter-

* 2nd ed. p. 145.

† e.g. Hardy, *Traité de la Taille* &c., p. 57 and fig. 12. Paris. 13th ed. now current.

‡ *Op. cit.* 15th ed.

minology were dealt with in the *Gardeners' Chronicle*, December 1914, p. 395.

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WATER-GARDENING.

By R. W. WALLACE, F.R.H.S.

[Read August 14, 1917; Mr. J. CHEAL, V.M.H., in the Chair.]

SOME of the most pleasing and delightful effects in the garden are associated with water in one form or another, and the great increase of late years in the love of gardening and all it entails has naturally meant the greater development of the water-side and water-surface wherever they are to be found. I do not propose to discuss the beauty of water in association with landscape, but rather the manner in which its beauty may be developed, if the surroundings are treated in the right spirit, so that the water and the surrounding vegetation are combined, the one helping the other to form a pleasing picture.

Generally speaking, the water in the garden may be classified as follows :

1. Where water is strictly formal, as when it is contained in a Lily pond or basin, of geometrical design, with fountain &c. As a rule, such effects are used as a central feature to some planting design.
2. An artificial pond of irregular outline, where, to obtain a natural effect, it has been necessary to concrete the bottom on account of the soil and situation.
3. An artificial lake made by damming up a water-course, or other means.
4. A natural pond or lake.
5. A river, stream, or brook passing through the landscape or woodland to be developed.

There are of course certain other aspects of the subject, such as the use of water in the Rock Garden, but I do not propose to deal with these to-day.

In introducing the question of formal water-gardens, and in fact artificial water-gardens generally, I fully recognize that I am treading on dangerous ground. May I preface my remarks on this division of the subject by quoting Mr. WM. ROBINSON ?—" So far as our island countries go, nothing asks for more care and modest art than the introduction into the garden, or home landscape, of artificial water." It is a question whether much of the labour, time, and money spent upon the construction of artificial water-basins would not be better utilized in the development of what natural beauties the garden may afford. They are not cheap introductions, and unless the setting is good, and the circumstances favourable, they can be, and often are, dismal failures.

The most absolute failure of all is the so-called Lily pond or pool

that has neither water supply nor outlet. Such introductions are to be avoided in any design. The formal pond must be one in which the water can be kept pure and sweet by a sufficient and regular supply of water, and a drainage system that will permit of a current being passed through the pool as frequently as desired. Lily pools that have to be filled by hand or the garden hose are doomed to failure from the start. Those that cannot be emptied easily, at will, are little better. The water will be stagnant and filthy, and, unlike good gardens, aquatic or otherwise, will be less beautiful the older they get.

I make these remarks in passing lest I should be thought to advocate the making of holes in the ground, with or without geometrical design, lining them with cement, and calling them what they never are, and never can be, water-gardens. Too often they are merely breeding holes for mosquitos and other pests.

Do not think, however, that I am deprecating the use of artificial water areas in garden schemes. On the contrary, I am one of those who believe that no garden is complete that makes no provision for the cultivation of aquatic plants. There are, however, some gardens that have to remain without it by force of circumstances. Better let them remain incomplete than try to force the circumstances and merely emphasize the fact that the situation is an impossible one.

For formal water-gardens the circumstances I should characterize as satisfactory are :

1. A liberal supply of water available, in such a position that it can be turned on or off at will.
2. The pool should form a part of some larger garden scheme, such as a main or central feature in a flower garden, be it devoted to roses or any other plants.
3. It should be in such a position that it can be emptied quickly, and without any undue expenditure of labour, by an outlet valve.
4. It should be of sufficient area to achieve its object, viz. the cultivation of aquatic plants, and deep enough to meet their requirements. Finally, in design it should be obviously part of the garden, not an isolated creation that involves resort to all sorts of extravagance to justify its existence.

As an illustration of what not to do, I might mention one I know existing within ten miles of this hall. It is a circular pool, constructed on ground that is not level, in an expanse of rough grass, under the shadow of a group of Beech trees. The result is that it has an ugly bank above it on one side, sloping to its massive concrete edge. Below it is another bank, still more ugly, falling away from it. It looks more like the concrete surround of a disappearing gun platform than anything else I know. If anything were needed to achieve absolute absurdity, it is assured by a feeble squirt rising perpendicularly from the centre of the circle. So slender is the column of water that it is scarcely perceptible in the dense shade, and with the faintest breeze it is blown away and disappears altogether. It remains a lasting

(unfortunately) example of the futility of gardening by fashion book. Nymphaeas will not flower in shade, nothing will grow there successfully, and it is about as hideous a nightmare as the worst architect of the early Victorian period could well be responsible for.

But indeed the really successful use of water in the garden scheme can give the most delightful addition.

Picture a long garden vista, sloping away from a terrace. The eye travels on between flower borders rich with summer colour. From these a grassy walk passes on its way under a group of over-hanging arching Cedars. Beyond them, on either side of the walk, is felt rather than seen the glow of many Roses, for it is the path through the Rose-garden. At the further extremity tumbling masses of mingled Rose and Clematis fling themselves above and over the pathway in rare profusion, and on beyond is the silver gleam of water, not the stream or lake of which I shall speak elsewhere, but a spacious artificial Lily pond. All the way from where we are standing the gentle fall of the slope, crossed here and there by a few shallow steps, seems to lead naturally and easily to the water's edge and entices us into the pathway leading to it. Nor is there disappointment in store for us when we reach it. This is no dirty stagnant water, but a pool, clear limpid, and serene. On it float the most beautiful of aquatic plants, the Nymphaeas, and during the heat of a sunny day, there are fountain jets that can be turned on or off at will. It is for the cooling splash of the water in the heat of summer that these fountains are particularly attractive. On a cold grey day they are not necessary, and can rest. But there is an additional attraction in this particular pool. All around its edges are growing freely water-side sedges, reeds, rushes, and other moisture-loving plants. This is ingeniously arranged for, by introducing a series of marginal beds inside the coping of the pool. It is so designed that these beds are kept permanently moist. The method adopted is to build an inner wall that comes up to a point just below the water-level. The space between the outer wall and the inner is filled with soil, and thus forms a wet border resembling the edges of a natural pond or lake. Those who feel that the Lily pond as usually constructed presents a hard and forbidding edge, may try this method in the full assurance that the result will be surprisingly enchanting.

There is another delightful effect that comes to my mind. In a garden that I know, one leaves the house and soon enters a cool, shady walk between stately trees and ancient trimmed Yew hedges. A sudden bend in the walk and a gleam of sunshine and glowing colour attract the eye onwards, and there below is spread out a garden panorama that can in no sense be conveyed by words. An area sunk slightly below the surrounding level of the ground, and in shape a large rectangle; the whole enclosed on three sides by high hedges of evergreen, and on the fourth the continuation of the path we are treading wanders away onwards through an enchanting woodland. It is indeed a landscape picture, for which the garden at our feet

seems to give us pause. But this garden is much more than an interlude, and I will try to describe it. Down three or four shallow steps and we are standing at the edge of a simply-formed Lily pool. There is nothing extravagant or ornate in its construction. The most simple of stone copings surrounds it. From this a wide channel some 100 feet long and 8 or 10 feet wide stretches away towards the woodland beyond. Upon the surface of the water are floating Water Lilies, Water Hawthorn, and a few other aquatic plants. On either side are borders of flowers, grasses, such as the Eulalias, the smaller-growing Bamboos, and the foliage of the Siberian Irises, giving a light and graceful touch. Here and there the plants in the borders have been allowed to escape and tumble in flowery profusion right down to the water's edge. Every point of view produces a new reflection. Some clear and sharp, some shadowy and indefinite, but all exquisitely beautiful. The whole garden, from the Water Lilies on the surface to the last flower in the borders, is in soft and beautiful tones—lilac, lavender, grey, pink, heliotrope and creamy yellow. Outside the borders on either side of the garden are paths formed of old and moss-grown bricks, and the surrounding level is retained by a low wall-garden full of Alpine flowers, and presenting a thousand and one miniature effects, over which one lingers with admiration. There is no sense in this garden as of the whole arrangement having been made for water effect, but it has to be recognized that without the water the garden would lose its attraction. That is the real place of artificial water in the garden scheme, one in which it is not obviously the main *motif*, but where, in its happiness of association, it is not obtrusively a water-garden.

Another point is to be emphasized. Never create large and expensive architectural embellishments out of all proportion to the area of water available. There are many such that are called pool-gardens, that would be better named stone monuments to inefficient gardeners or over-zealous builders. The keynote of successful water-gardening is its simplicity. In a formal design you must be formal in your water scheme: but this does not mean that you must be intricate. If you want a builder's exhibition in the garden, have it by all means, but do not make water-gardening an excuse for it. Ornament is justifiable if used in moderation and with restraint. Excess of it will ruin any water-garden effect.

I cannot linger longer on this division of my subject, though I should like to. I should like to scan the merits of the simple circular pools that form a centre for a Rose-garden design. In this the minimum of masonry is the most effective. I think a simple stone edge, moss-grown and grey, is the best, and just three or four of the best Water Lilies bejewelling the surface. Such pools can be very attractive, but we must now turn to the second section of the subject.

An artificial cemented pond or lake of irregular design is not always a pleasing feature, because of the hard outline which is very difficult to hide in a satisfactory manner; again, because of the diffi-

culty in planting moisture-loving and semi-aquatic plants around the edges. Generally speaking, the best effects are obtained by masses of shrubs, generally Rhododendrons and Azaleas, planted some way from the edge. Of course, in such a piece of water, Water Lilies may be grown very successfully. It is not, generally speaking, worth while to form an artificial piece of water, but if there is an overflow from some source to be dealt with, and the lie of the land suggests an expanse of water, then the construction is, I think, justified, especially if it comes well into the landscape from the house, and if it is suitably planted it should be an addition to the garden; but it is not a feature that appeals to me, therefore I will pass on to the consideration of sections 3 and 4.

3. An artificial lake that has been made by damming up a water-course or other means.

4. A natural lake and pond.

Where a water course has been dammed many fine sheets of water have been formed, and this can only be carried out successfully when the surroundings are such that the newly formed sheet of water appears to fit into the landscape naturally. Such water would always be found at the foot of a slope or hill. The planting around such lakes and those that are natural is generally of a bold nature—large masses of Rhododendrons and Azaleas for summer effect, and Scarlet Dogwood and golden and crimson-barked Willows for winter effect, are typical of much planting which in the past has been generally of an evergreen nature, and therefore rather sombre when the flowering season is over. Many of the larger-flowering shrubs and trees may be used to advantage, such as Viburnums, Spiraeas, Sambucus, Catalpas, Magnolias in moist sheltered corners, Liquidambar for autumn effect, *Cercis Siliquastrum* (the Judas tree), *Clethra alnifolia* (the Virginian Sweet Pepper tree), flowering in late summer with feathery spikes, of sweet-scented white flowers.

Good use may be made of the flowering Thorns and Sea Buckthorn, the native Blackthorn overhanging many a pond and beautifying it with its wealth of small white flowers in early spring, Weeping Willows, especially the golden form and the Silver Willow—*regalis*—and in a position sheltered from wind generous planting of Bamboos. In well-drained soil by the water-side a glorious effect may be obtained by an occasional planting of the Penzance Briar Roses. Many years ago I saw the variety 'Jeanie Deans' in flower at the edge of one of the ponds at Easton Lodge, 20 feet high, a mass of colour reflected in the water.

The larger-habited and bolder herbaceous plants are also suitable for large planting around lake sides, and from a number of suitable subjects I only mention a few. *Spiraea gigantea* and *S. gigantea rosea* will grow 15 feet high, their bold foliage turning to bronze and orange in autumn. The handsome foliage and flower heads of *Senecio clivorum*, the upright yellow spikes of *S. Wilsonae* and *S. Veitchianus*, are worthy of fine grouping, whilst *Eulalia* in big

masses, interspersed with clumps of Kniphofias and Pampas Grass, can be arranged in a fine setting.

For large lakes such as we are speaking of, good use should be made of the Rheums and Gunneras, the finest being of the latter genus *G. manicata*. Whenever possible, plant them on a tongue of land running into the water or an island, so that the bold foliage stands out plainly from its surroundings.

For a long distance effect the White Poplar, when properly grown, is a striking object of July beauty. The effect of a large tree against a dark background is as though it were a mass of burnished silver. The bat Willow (*Salix alba coerulea*) is of similar appearance, and of course is worth planting on account of its commercial value. The fine cut-leaved Alders and the deciduous Cypress should always be planted in conjunction with the water-side.

I have but briefly touched on the fourth section of my subject, and will pass on to the consideration of division 5, viz. A river, stream, or brook passing through the landscape or woodland, or a combination of both.

Positions such as these are full of possibilities, and it is upon them that I wish to speak most fully to-day. The opportunities for woodland gardening are endless and have been much neglected in the past. Assume for the moment that you have recently acquired a large or small area of woodland with a stream flowing through it, perhaps connecting a series of ponds; it may be more or less level or falling ground. You would proceed to clear away the tangle of undergrowth through which the stream passed, showing up the tree trunks here and there, and in clearings along the stream side plant masses of moisture-and-shade-loving plants, and where portions of the surrounding ground were fairly flat you could carry your planting masses well into the recesses on either side. When the ground falls sharply to the stream you will probably find small ditches acting as feeders to the main stream. Their surroundings should be all cleared and the small water-courses shown up. Then you can run lines of colour up the ditches on either side with, for example, such plants as Primulas in spring and early summer. Imagine for a moment standing below and looking upwards at a mass of many thousands of *Primula pulverulenta* grouped on either side of the small stream making its way downhill, and, as an irregular background to the Primulas, the woodland itself in all its fresh spring beauty. Or, earlier in the year, imagine the sight of many *Primula rosea* planted in similar manner, giving a vision of intense clear colouring. In May, long lines of Trollius would be seen, followed by the Panther Lily in July. Again, suppose a small feeder stream is descending through open meadow-land just where there is only a fringe of woodland. Here in the meadow you would plant *Iris sibirica*, *I. orientalis* 'Snow Queen' and 'Emperor' in many masses, and as you stood below in the half shade of the wood at the junction of the feeder stream with the main, looking up you

would see the countless spikes of the Irises bright in the sunlight and probably reflected in the water, whilst where you stood and all around you would be masses of Epimediums, Double Welsh Poppies, *Orchis foliosa*, Lady Ferns and Ostrich Ferns grouped with the beautiful plumose forms of the Aspidiums, and above them in the higher ground *Lilium rubellum* might be seen in flower and *Lilium Szovitzianum*, the white Martagon Lily, and fine contrasting foliage of Solomon's Seal and Plantain Lilies.

There is practically no limit to the planting that may be done in moist woodlands. Clearing must be done with care and skill, so as to preserve the best features of tree and shrub life, especially taking care of the Silver Birches—their graceful outline and foliage is so valuable. A small clearing by the water with Silver Birches a few yards distant will be made a delightful picture if the space in the foreground is planted with white and yellow Polyanthus. Again, in another clearing, where there is plenty of room, plant a tall golden Weeping Willow; then, in the latter part of April, it will be a cascade of pale gold, whilst at its feet masses of pale golden Trollius or *Primula sikkimensis* would fill in and make a perfect picture. In early spring great use should be made of the Wood Anemones, especially the sky-blue *A. Robinsoniana* and the newer varieties, *Alleni* and 'Vestal,' which are twice the size in flower with double the vigour of growth. In open spaces good use may be made of the blue and white Apennine Anemones; but here the ground must not be too moist. A good illustration of this suggestion will be seen in "Gardening Illustrated" for August 11, 1917.

It will be noticed that many of the plants named are not true water-side plants; but the point I wish to emphasize is that all plants look so much better when seen in conjunction with the stream or water's edge. Walking through the wood and looking across the stream from time to time at masses of plants growing in close proximity, the water will give added life to the picture.

So far our remarks have only referred to the small stream passing through the woodland, but more often than not these streams lead to a pond, and should such a position occur it is best to deal with it carefully, clearing out around the same and forming one or two long vistas throughout the woodland, so as to make the pond the central feature. Let the principal vistas be fairly straight and not serpentine, because, above all, you want to see into the woodland and get the distant effect of light and shade. In forming such vistas an occasional fine tree trunk or group of stems makes a splendid termination or a centre for tracts to cross. On either side of the green ways there must be informal groupings or planting, saving what is best of the natural growth and adding to it. Free growing roses in informal masses, such as 'The Gaillard,' 'Carmine Pillar,' 'Una,' Penzance Briars, &c., which only require a little thinning and cutting back, will form large mounds and, running up adjacent trees, cascades of flowers. Clematis of the Montana type and Flammula and Viticella

forms may be similarly used. I would have the planting of the broad vistas dealt with in a bold way, using large subjects and plenty of them, and then from these broad vistas many smaller paths, which would lead to the quieter parts of the wood, such as a group of Silver Birches or Scotch Firs that stand in a small clearing. Here all around I would mass many of the beautiful forms of Azaleas, Lady Ferns, Polystichums, and many others, amongst them Foxgloves and occasional Mulleins and a few Lilies, such as *Saxifraga* and *giganteum, regale*, etc. There will be colonies of Cyclamen both spring and autumn, and on one side a low carpet of *Gaultheria procumbens*, from which would rise the taller *G. Shallon*, Honeysuckle in masses, and perhaps one rose in a tangled mass of beauty from behind a group of *Cytisus praecox*, carpeted with the double lilac Primrose long past its beauty. I notice I only mentioned the English ferns, but one must also use freely by the stream side some of the North American species, such as *Onoclea Struthiopteris* (Ostrich fern), *Osmunda Claytoniana* (the Crozier Fern), and *Osmunda cinnamomea*, not forgetting our own Royal fern, and the hardy Canadian Maidenhair (*Adiantum pedatum*). Associated with the ferns in the drier spots can be used freely the North American Trilliums and Dog's-tooth Violets, all of which will beautify the ground amidst the ferns and help to make a picture with their unfolding fronds. I know of no finer plant for individual effect in the open moist woodland than a colony of the blue Himalayan Poppy (*Meconopsis Wallichii*). Choose a position fairly damp, where the woodland is thin and yet affords shelter from wind, and here you may plant it, and from the day its foliage begins to form until possibly eighteen months or two years later, when the stem has developed to a height of eight feet or the last pearly blue flower has faded, it will be an object of beauty. The effect of many spikes of shimmering pale opalescent-blue flowers and the foliage on damp days studded with drops of water like diamonds is irresistibly lovely. If your woodland stream should by any chance pass through peat, then great will be your opportunity with such glorious plants as Kalmias, Pernettyas, Andromedas, Epigaea, Shortia, Schizocodon, Galax, and hosts of other peat-lovers.

I have so far dealt with water in the woodland and some of the many forms in which it is generally seen in gardens. When I say dealt with—I have only just touched on the various phases of the subject, as it is impossible to deal with them all completely within the limits of a single paper. But there is another aspect of water-gardening, and one on which I wish to lay particular stress. That is, the possibilities of development regarding flat meadow-land adjoining a water-course, and through which a tiny brook or small canal finds its way to join the main stream. By merely diverting this small feeding stream and digging out various channels and widening them at intervals into larger pools, we soon have a network of small pools and water-ways all set in meadow-land capable of much fine planting. Such a flat

piece of land might well join the woodland we have just been contemplating; and passing from the wood we find ourselves in what was once a meadow unrelieved by any planting, but now presenting a picture of slow-moving streams with their banks clothed at intervals with slender vegetation rising in soft outline, widening here and there into pools on whose surface are floating many-coloured Water Lilies; the skyline broken by the planting of Willows, whose graceful habit and soft colouring give an indescribable charm to the landscape. Here in these surroundings much planting can be done. Should there be any great expanse of water, places could be found for the giants of the water-side, such as the large-leaved Gunneras and Rheums, the semi-aquatic Reed Maces *Typha latifolia* and *T. angustifolia*; the giant Reed *Arundo Donax*, which I have seen in September 16 feet high, and a few of the graceful Bamboos, Eulalias, and many others.

Mention has already been made of the value of the Willows. They serve to give a height to the landscape and softness of outline. *Salix vitellina aurea pendula* should be planted freely, for a more beautiful tree in spring I do not know. The drooping branches seem to be involved in a mist of golden rain. The weeping White Willow is very beautiful, and possesses a picturesque outline of growth peculiar to itself. A few bushes of the Silvery-leaved Willow, *Salix regalis*, make a pleasing change, as does also the Rosemary-leaved Willow. Two dwarf Willows, used mainly for clothing banks and filling odd corners, are *Salix purpurea nana*, very pleasing in its purple stems and dense fine foliage, and *Salix sericea pendula*, with its downy grey-leaved procumbent stems reaching out over the water. The cut-leaved Alder (*Alnus laciniata*) and the similar foliaged *Sambucus tenuifolia* are both to be noted as fine. In reeds and rushes we have many fine plants. The large Typhas I have already mentioned, but you cannot do without the slender *T. stenophylla* and the tiny *T. minima* with its curious globe-shaped mace. The wild rice (*Zizania latifolia*) rises high in a corner with its Iris like foliage, the rustle of which is always distinctive. I have never seen it in flower, though in September the tall spikes with handsome polished green stems begin to lift themselves, but never develop fully on account of the lateness of the season. Among the smaller-growing inhabitants of the water-side, both semi-aquatic and otherwise, will be found the sweet flag (*Acorus Calamus*)—how few know the fragrance of its leaves!—and the Japanese variety, with its finely variegated foliage; the beautiful native flowering rush, with its pink cup-shaped flowers borne in umbels, the Galingale (*Cyperus longus*), a most distinct and ornamental plant at the water's edge, which, with its tall, slender, and aristocratic foliage (if I may use such a word in these democratic days), terminates in a spiked inflorescence of green and brown; the Bog Bean (*Menyanthes*), which reaches out over the water's surface and whose grey leaves and pink flower-heads form such a delight. I cannot mention everything, but we must not overlook the Giant Buttercup (*Ranunculus Lingua grandiflorus*), with its free growth and tall spike

of yellow flowers, possibly the best of all water-side plants. Nor must I omit the water Forget-me-not. Along the banks of the smaller and narrower streams much effective planting can be done by the use of the lesser-growing bog plants in broad masses, with occasional planting of larger-habited plants. In such plantings will be found masses of *Mimulus* growing and flowering in greatest profusion, such as *luteus*, *cupreus*, *Berneti* particularly effective, and 'Brilliant,' which is so beautiful in its dark colour and dwarf habit. The King Cups (*Calthas*) are fine in spring, particularly *Caltha polypetalata*. Primulas, of course, are there in many colours. On the shady side particularly fine is *P. sikkimensis* and *P. pulverulenta*, and its white variety 'Mrs. Berkeley' in half shade against a dark background; and, later in June, the golden *P. Bulleyana*, which will be a mass of many hundred spikes three feet high, in a moist and partially shady clearing. Then we have all the seedlings arising from the crossing of *P. Bulleyana* and *P. Beesiana* in all shades of pink, orange, scarlet and pale lilac—a wonderful race; and I look forward to when we can grow *P. Littoniana* as George Forrest first saw it, in moist grassland alive with a thousand scarlet-tipped spikes. Lastly, we have the new yellow *P. helodoxa*, easy to grow and early in flower, the clear colour of its flower reminding one of a Daffodil. *P. vincaeflora* will also do in moisture. The purple *Orchis foliosa* and *O. maculata superba* will be in happy surroundings growing close to Epimediums, which latter are highly prized on account of their beautiful foliage, falling right down to the water's edge. As taller occasional plants, we cannot do better than make free use of the Irises of the Sibirica group, particularly 'Snow Queen,' and *I. Delavayi*, and our wild English water-flag and its primrose-coloured form. Of the newer grassy-leaved species we have forms of *I. Wilsonae*, *I. Forrestii*, and *I. Bulleyana*, all free-growing and very distinct, the yellow of the two first being most valuable in their sections. I must not overlook the deep Royal purple *I. chrysographes*, a gem of colour, though very fleeting: and smaller-growing Iris for the main stream are *I. albobpurpurea*, a mass of China blue and white, *I. laevigata*, of distinct habit and dark-blue colouring, and its white variety, and the tiny *I. gracilis*, which does very well in half shade.

One could go on at great length, but a list of names will only weary.

I will now draw brief attention to some of the bolder-growing herbaceous plants which thrive amongst moist surroundings. Allusion has already been made to the Astilbes, and these, together with the Spiraeas, form, I think, the most important group we have: easy of growth and increase, free-flowering, they are indispensable during the summer months. The unique crimson colour of *palmata* is superb, and when well established this species reaches 3 to 4 feet in height. Tall plants of fine stature and superb foliage to be seen from a distance are the white-flowered *S. gigantea* and its pink variety, and *S. venusta*, with 6 to 8 feet high spikes of soft rosy-pink flowers. These two Spiraeas may be well grouped together with *Gunnera* and *Senecio*

Clivorum at some distant point seen across the water, and I might also add *Rheum palmatum* for early effect. The introduction of *Astilbe Davidii* has given rise to a number of hybrid forms partaking of the strength of *A. Davidii*, but with a more subdued range of colour. Some of the best are: 'Salmon Queen,' 'Cream Pearl,' 'Venus,' and 'Vesta,' forms which have given quite new colours to this genus, whilst the still newer 'Queen Mary' and 'Rubens' are two grand forms, the former being brilliant rose, whilst the latter is a particularly soft shade of pink.

Astilbe grandis, one of Wilson's Chinese plants, is delightful in its early growth: the ruddy tinted stems covered with hairy growth contrasting effectively with Trollius in creamy shades close by. In fact, many of the Astilbes are worth special grouping on account of their foliage in the young state, which acts as a delightful foil to such plants as already mentioned, Trollius, Double Welsh Poppy (which is splendid by water), Mimulus, &c. Bocconias are fine in foliage and flower, especially when escaping late frosts. Lythrums, especially the variety 'Rose Queen' and *roseum superbum* (I saw a real soft pink seedling the other day, a colour much wanted), also *Eupatorium purpureum*, a unique and handsome plant, whose fine tall heads of flower are very effective from a distance. I noticed a few days since a grouping of the *Eupatorium* and *Senecio Clivorum*, and the cream *Artemisia lactiflora* against the silver-grey Rosemary-leaved Willows—a charming effect of purple and orange, cream and silver.

So far in these remarks I have omitted all reference to what I think may be called amongst hardy plants the chief glory of the water garden in July—the Japanese Iris (*Iris Kaempferi*).

There is a general desire to grow these fine plants, and having been particularly successful in their cultivation, I may perhaps refer here to what I regard as the main conditions for success. They will do well in any well-worked soil and that which is rich in vegetable matter, but avoid planting in heavy clay by water-side. On meadow pasture land along side ditches and small ponds, planted just above the water line, in soil that has been well dug and manured, they will thrive splendidly and often seed themselves about. Another point, division after flowering in August is best. You will find in early autumn quantities of new roots pushing, so that by early planting you gain all this new root action. Again, in February countless fibrous roots are pushed out. This is the time to mulch freely, and about May dam your ditches if possible and flood freely. Division of the clumps every two or three years is good, and planting in fresh soil: such greedy rooters quickly exhaust their surroundings. You may say, "Why take all this trouble?" Well, if you do you will have foliage over 3 feet in height, and spikes 4 feet high, five to six on a clump, and your water-side and ditches will glow with colour, huge flowers more like gigantic butterflies just poised, and such a combination of colours as I think are not to be found in any other plants. One more point: always plant in fullest exposure in the sun; remember

they cannot have too much water in the growing season, but when at rest, as little as possible.

To those of you who have not been to Japan I recommend a study of Miss Du CANE's pictures in her book on "Japan." From this you will learn that one of the most effective ways of planting this glorious Iris is near to any low stone bridge crossing the water; massed on either hand, they seem to invite you amongst them. I have just referred to crossing the water with low stone bridges. Long broad flat stones placed just above the water surface and crossing your narrow stream at intervals, or the use of stepping-stones or both combined, are fine features in the water garden, and always at such crossings group at either hand, as has already been suggested, *Iris Kaempferi*, tall reeds, and rushes. These, when rightly placed, and not too many of them, give you that necessary feeling of support, and seem the natural finish to the bridge or stepping-stones.

Mention has already been made of some of the semi-aquatic plants growing by the water's edge. How incomplete the water-side would be without them! How graceful they are, and how they seem to enjoy the water; what coolness and comfort they suggest! The Vision of the great prophet Isaiah points out that the resting-place for tired humanity shall be "grass with reeds and rushes."

You must include in your water-ways the true bulrush (*Scirpus lacustris*), the reed maces from the giant to the smallest variety, the porcupine and the twisted rush, the sweet-scented Flag *Acorus*, the Bar reed, *Sparganium*, the Arrow-heads, especially the double white, the Golden Club with its curious unfinished-looking flower, the Bog Arum, and our native Flowering Rush and Bog Bean (two beautiful plants), and the water *Ranunculus* and the yellow *Villarsia*. One word of warning: all the above are rampant growers, and must be kept in check, otherwise they will quickly choke your water-courses.

So far but little mention has been made of the beautiful new hybrid Water Lilies. No water picture is complete without them. The majority are of easy growth, and quickly increase when once established. There are many varieties, but a few will suffice. The white *Gladstoniana* is a noble flower quite unsurpassed, and of pale pinks *Marliacea rosea* and *Colossea* are indispensable. In deeper shades of pink we have 'W. B. Shaw,' very free and sweet-scented, 'Masaniello' and 'Formosa,' and the glorious pink 'Mrs. Richmond,' quite unique in size and colour, the rose-pink 'James Brydon,' *Marliac's* masterpiece, the glorious ruby-red 'Escarboucle,' and 'Wm. Falconer' of deeper colouring. 'James Hudson' is very free and of a rosy crimson; the pale yellow *chromatella* and *Moorei*, of a deeper shade, a better plant. This short list I have given contains all the best growers and finest colours. Any pool, stream, or lake without their glorious flowers floating on the surface is incomplete.

I fear that my remarks on the water-garden have covered too wide a range. It is to me a garden full of interest, from the early days of the King Cup in March until the end of October, when the

autumn effects are slowly dying. All through the months of April and May fresh pictures keep forming and fading, and then in July it reaches its zenith. The light and reflection in the water aglow with many-coloured Water Lilies, all around masses of Astilbes, Spiraeas, and *Iris Kaempferi* in full beauty, the Giant Ranunculus, and the blue water Hyacinth and Forget-me-not ; and over all a note of fullness and richness and, in spite of the summer heat, a sense of delightful coolness.

I urge all who can to develop the opportunities that any water in the garden presents to the fullest extent. Even the ugliest and straightest ditch with a little water running through it, with slight alteration, can be made a thing of beauty all the growing year.

In bringing my remarks to a close I am only too conscious that there is much more I should have said, and perhaps much of what I have said would have been better unsaid. The subject is so vast and it is so difficult for the inexperienced to convey the visions of beauty that he himself sees and often fails to paint in words. However, if in any small measure my remarks are found helpful, then I shall be satisfied. The subject is vast and knowledge is limited, but the more we endeavour to help others to a better understanding of the beauties of Nature, in the same degree we shall be helped ourselves.

PERGOLAS.

By Mr. EDWARD WHITE.

[Read Oct. 23, 1917; Mr. E. A. BOWLES, M.A., V.M.H., in the Chair.]

THE early history of pleasure gardens refers to countries in which the summers were excessively hot and where it was imperatively necessary to provide shelter from the fierce sun.

For the purpose of affording leafy shade no plant could be more serviceable than the pliant and luxuriant grape vine, and it is to this no doubt that the pergola owes its origin.

The device of the pergola is very ancient. It is illustrated in old Chinese records, and we even find in Egyptian hieroglyphics representations which suggest with sufficient accuracy the form of the pergola of to-day. What is in effect the cross-section of a vine-clad pergola occurs as a decorative theme in many ages. Examples are found on friezes unearthened from the ruins of Pompeii and Herculaneum.

In the references to gardens made by ancient classical writers emphasis is almost invariably laid upon features designed to afford shade. We find that trellises of fruit trees and vines were employed to temper the sunshine in Roman gardens. Much later, but centuries before the general introduction of pleasure gardens in this country, pergolas and pavilions, tunnels and arched hedges were common details in the gardens of Italy.

Mr. INIGO TRIGGS, in one of his excellent books, quotes Crescenzi, the Italian garden designer of the thirteenth century, who wrote of his pergola of vines as follows: "As in trees of this kind shade is sought rather than the fruit, they must not be too dry, and care should be taken that the trees be neither too many nor grow too thickly, because the shutting off of the air corrupts the health of the place; also because the garden requires a free current of air."

That was written nearly seven hundred years ago. In the Renaissance gardens of Italy, a century or two later, pergolas attained the zenith of extravagant elaboration.

In our country the sun is regarded as a benevolent if somewhat elusive deity rather than as a despot. There are times, however, when it sees fit to exert relentless power, and for such occasions shady retreats are gratefully welcomed in the garden.

The history of the pergola in England is very fragmentary. It is linked up with that of trellis arbours, gallery walks, pleached alleys and the like, which from early Tudor days onwards have been familiar features in fine gardens. There was little difference in intention between the old gallery walk and the pergola of to-day.

The Hon. Mrs. EVELYN CECIL, in her "History of Gardening in England," says that "such galleries were marked characters of late fifteenth and early sixteenth century gardens, designs being found in some old works, notably in the "Hortus Floridus" of CRISPIN DE PAS (translated 1615).

"They existed in Hampton Court before Henry VIII. made his alterations there, and are referred to in Cavendish's metrical life of Wolsey :

' My galleries were fayre both large and longe
To walk in them when it liked me best.'

No single example of one of these original galleries or arbours appears now to be in existence, the explanation being that the pillars were made of perishable material and not of stone as in Italy.

"Few if any examples are to be found in English illuminated books, although plenty of pictures occur in foreign MSS. of this period, especially French and Flemish."

The one, and as far as I know the only, book in England devoted to this particular subject is SMITHSON'S "Book of Pergulars," published early in the seventeenth century. The word "pergola" was formerly used chiefly in the significance of the Latin *pergula*, meaning a shelter or bower, rather than to describe the leafy garden corridor which now monopolizes the term. The expression pergola is noticeably absent from JOHN EVELYN'S outline of the *magnum opus* on garden art which he projected but did not write. Every other conceivable garden feature seems to be named in the detailed summary of the work which he prepared. Evelyn uses the word elsewhere, however.

The great revolution which overwhelmed gardens in the eighteenth century would have been scarcely practicable if shade had been an imperative condition in the enjoyment of an English garden. The climate did not avail to save from destruction any of the shade-giving features which favoured formal design. The system of gardening which succeeded and remained in vogue for a century or so, in which straight lines found no place, offered little opportunity for the pergola. An important outcome of informal landscape gardening, however, was the stimulus given to the production and discovery of new trees and shrubs, and the interest developed in individual plants. These naturally included many fine climbing plants needing some special means of support.

This requirement has been met in the type of garden architecture evolved during the last quarter century, in which the pergola has been so justified that it is now as securely established in English garden design as if the shade it gives were an indispensable necessity.

But it should be remembered that the *raison d'être* of a pergola is to provide a shady walk, or, at all events, to afford shade where desired, and it should consequently be placed where this purpose is best served in the scheme of the garden. The most obvious position is a straight, exposed, and frequented thoroughfare. A pergola

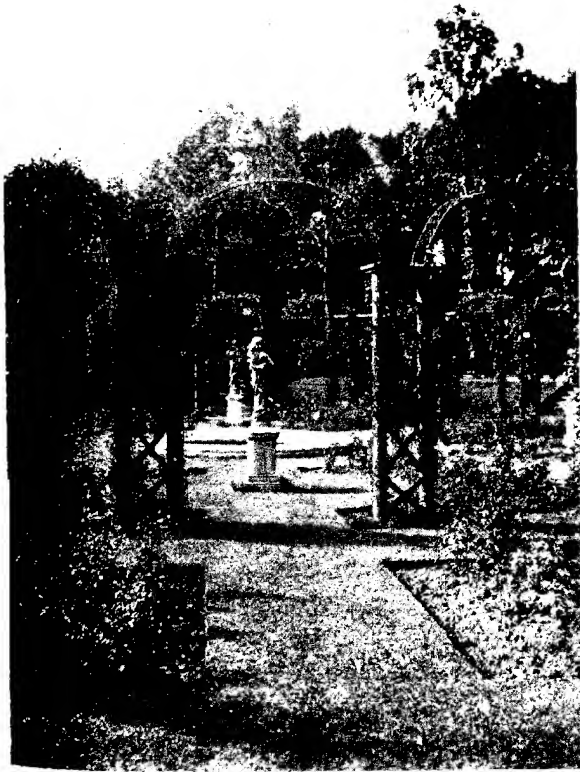


FIG. 45.—IN THE GARDEN, MORETON PADDON, WARWICKSHIRE.

(To face p. 202.)

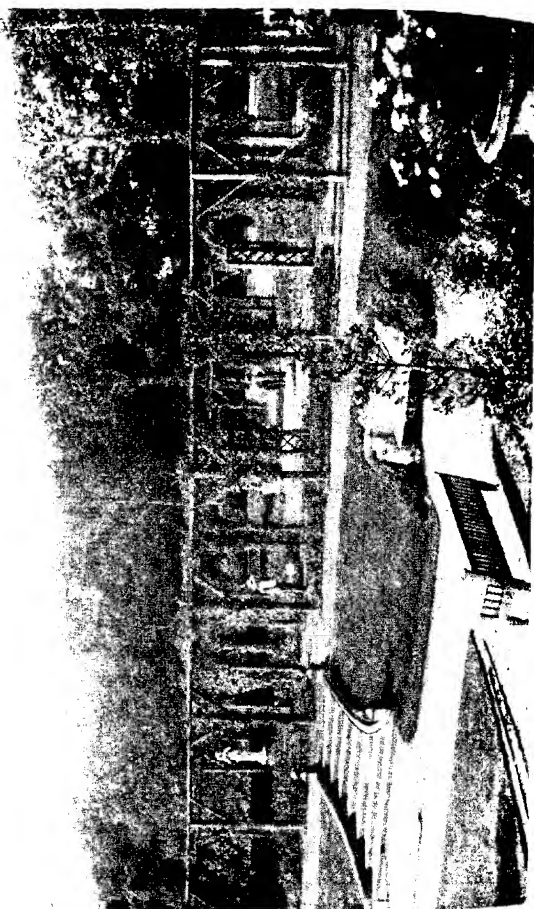




FIG. 17. A PERGOLA AT MARDEN PARK, SURREY.

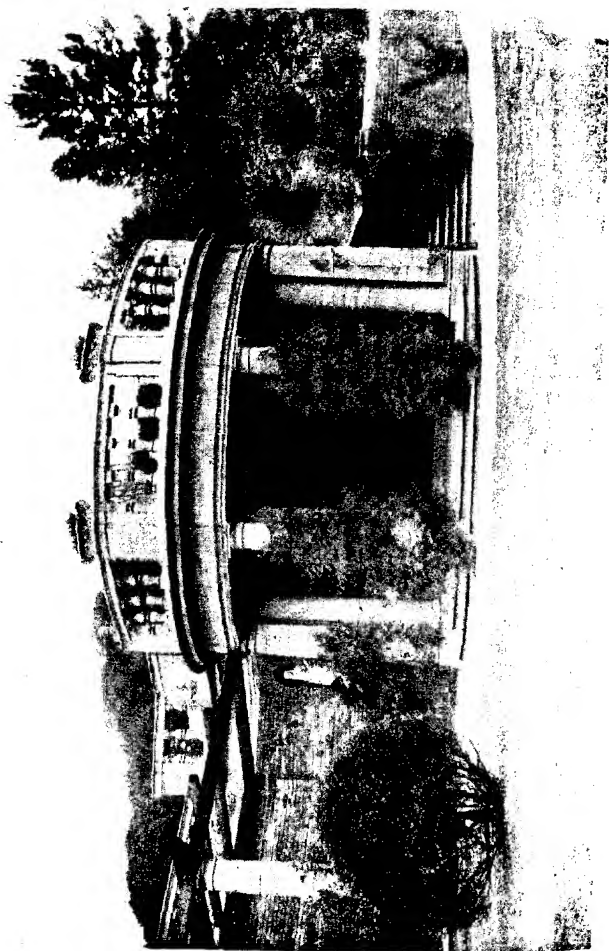


FIG. 3. THE HOUSE OF THE PRESIDENT OF THE UNITED STATES

cul de sac should be generally in some part of the garden convenient as an arbour. A pergola should not be placed where it is of little use from the practical standpoint.

However charming it may be, and however liberal its wealth of flowers, it does not follow that the addition of a pergola to the larger garden pictures is necessarily good. It may be quite otherwise unless it forms part of a considered composition. If this is true in respect of an entirely new garden, it is clear that the addition of a pergola to a well-designed old garden needs very careful consideration.

We may compare this feature in some respects to an avenue of trees. Like an avenue, its main effect is to emphasize a certain line, and where such importance is bestowed, it must be rewarded by a satisfactory ending. If the eyes or footsteps are conducted to a point of little interest one feels that effort has been wasted. The line should be preferably straight, although a good effect is sometimes obtained by a regular curve. The sides should be free from continuous planting, by which one does not mean flowers. The pillars should be considered as belonging to the pathway and forming part of it. The material used for the latter should therefore be carefully chosen in order that it may appear to bind the piers together, and so assist the sense of unity and repose.

The appearance should be substantial and comfortably permanent in effect, but the grace of some pergolas is sometimes compromised by too heavy piers. Seclusion and quietness are desirable for pergolas intended to be used as arbours. A pergola should not unnecessarily monopolize the garden landscape, although it is sometimes a useful device for masking the poverty of an outlook.

When a pergola is placed on the central axis of a garden view the garden is cut in half, and this should not be done without full justification.

The effect of colonnading has an artistic value which is unique in architecture, and is independent of style. Partially clothed columns of a pergola with beams overhead bearing foliage of varying density lend themselves to unending experiment in perspective, and in the play of light and shade. These are factors of too much value to be left to chance. Those who derive great enjoyment in a garden by discovering every picture it has to offer, will always pause on the threshold of a well-made pergola in anticipation of the pleasing effects of the lights and shadows. The management of these effects is a difficult art, but the material with which one has to deal—the branches of the plants and the foliage—is amenable to discipline.

One understands and appreciates the importance of perspective effects in the corridors of a house. A pergola offers opportunities of equal value, which, rightly used, dispose of a not uncommon suggestion that it is chiefly worth seeing from the outside.

From an architectural standpoint the pergola is often very useful as an aid to composition and a means for giving variety in outline, continuity, connexion, and other characters which it is desired to

accentuate. It is specially important as a means of unifying the house and garden.

In fixing a position for a pergola, therefore, one has to consider its practical utility as a shady walk, its relation to the house, and its influence upon the principal garden pictures.

A garden which is well planned generally offers at least one position for a pergola. The most common opportunity lies in the extension of a terrace walk terminating in a garden house or arbour, or working up to some climax at a change of axis.

Picturesque effects may be obtained in the fashion of the old gallery walks, by completely enclosing the sides of a formal garden, a Rose garden, or croquet lawn, or some such symmetrical feature. A tennis lawn should not be so enclosed, as the light is spoiled for playing. An ugly wall may often be transformed by building a pergola against it. Appropriate situations are easily recognized and are generally available, and wider opportunities may be created with the aid of a little imagination.

A pergola is too rarely associated with water, in which the reflection gives such delightful results. Instances may be quoted of a straight canal flanked by pergolas and connected at the head by a bridge pavilion, of a large pool encircled by a pergola with a fine fountain in the centre, of a square pond with arbours at the corners linked together by pergolas. A charming view has been presented by a pergola flanking a pond sheltered by a wood and leading up to a boathouse.

At Marden Park, Surrey, where the slope of a hill was retained by means of a high brick wall, a probable eyesore was transformed by the addition of a pergola. A balustrade which protected a walk at the top made an unusual and effective addition.

A pergola is generally well placed where it overlooks a wide view at the summit of a series of terraces. A note of character is given to one from which the ground falls on one side, affording opportunities for dry walling and steps.

A pergola of considerable length is generally improved by variation in what one may call the roof lines, by a domed section, for instance, over a part arranged as an arbour.

When the relation of a pergola to the garden scheme is decided, one has to consider the design and details of construction, and subsequently the important question of planting. If the pergola is associated with the house or some other building, the design and materials should be in architectural agreement. Timber uprights are at times quite appropriate to such conditions.

A special essay would be necessary to deal with all the architectural possibilities and problems of the question. I will not attempt more than a few general remarks on the subject.

The degree of refined workmanship is decided by the style of the house, but the material may be more roughly worked. Columns may be built of many kinds of material, building stone, bricks, roofing-

tiles, concrete, and so forth, in addition to wood. Ironwork is not altogether desirable, but it is possible to counteract the effects of contact between the metal and stems of plants by tying on wooden fenders. The occasional practice of buying marble or other such columns from a dismantled mansion for use in a garden is not to be recommended, except for very unusual circumstances. I know three people who have such columns, bought on impulse, and never used.

Roughly sawn Oak and Teak are the most suitable timbers for columns. Larch of sufficient size is good for rustic work. Scots Fir and Spruce are not lasting. Those pergolas which collapse as soon as the plants which clothe them are arriving at perfection prove a great disappointment, as is one which has to be painted at intervals, and needs stripping for the operation.

It is not worth while to elaborate the architectural details of stone or brickwork intended largely to be covered with foliage. As, however, the columns should be left exposed to an appreciable extent, the colour and texture of the material are important considerations. Needless to say, they must be handled in a craftsmanlike manner.

Common stock bricks are ugly in shape and size, and very often in tone, and their unnecessary use has often given to a well-planned pergola a commonplace appearance. The pleasant tone which is so much admired in old Tudor bricks may be reproduced by employing selected hand-made English bricks of small size. These are procurable in a soft red colour, which tones well with a warm purple brick, skilfully blended. Delightful effects of light and shade are given by such bricks and accentuated by building with wide mortar joints.

In districts in which building stone can be obtained local material is generally used. Excellent results are produced by thin laminated stone with rough edges and surfaces, built with the mortar joints well set back, after the fashion of dry walling. A good deal of ingenuity is sometimes expended in making patchwork of local material bricks, stones, tiles, concrete and such like. Such work needs to be done by a craftsman, with a sense of unity and complete mastery of material, otherwise a laboured and affected appearance results, which is exactly the opposite of the intention. Good work may be done with concrete (sometimes rough casted and tinted), with roofing tiles, fused red and purple brick burrs, and various other building material.

The piers of a pergola are required to sustain the combined burden of the wooden beams and the planting. The business of the beams is to tie together and strengthen the piers, as well as to carry the planting. The piers and timbers must be strong enough for their work, but if they are disproportionately large they will look clumsy. Heavy work is occasionally needed for architectural effect, and it may also be justified by the considerable length of a pergola. Otherwise the effect is more graceful if the material appears just comfortably strong, and no more. This is especially the case in respect of circular

piers. One must, of course, concede something to the semblance of weight in a great mass of foliage.

The following dimensions may be taken as a working average :—

Brickwork piers, 14 inches square ; stone piers, 18 inches, varying with quality and size of stone ; solid circular stone columns, 12 inches diameter ; Oak or Teak uprights, 11 inches square. These are calculated to carry 10-inch by 8-inch longitudinal timbers, and 7-inch by 5-inch transverse beams. The piers are assumed to be 12 feet apart lengthways, 8 feet 6 inches high, and 10 feet from centre to centre in the width of the pergola. These are suggested as minimum dimensions where considerable strength and permanency are desired. The size of the timber may perhaps be increased to advantage so far as appearance is concerned.

The importance of sufficient width cannot be overrated—it makes the whole difference to the comfort and consequent enjoyment of the pergola.

It should be taken as a rule that the breadth should exceed the height, and the distance of the piers lengthwise be greater than the width. The length of the pergola naturally affects the proportions throughout.

Needless to say, the piers must rest on firm foundations. Timber uprights should be charred or treated with preservative. The longitudinal beams may be built into the top of the piers, and the cross-pieces should project a foot or so over the sides. It is also better to cut the latter with an upward curve in the middle, as straight transverse beams seen in perspective have the appearance of sagging in the centre.

I should feel inclined to disregard the well-discussed question of planting if it would not savour too much of "Hamlet" without the Prince.

In addition to the great number of climbing plants available, many shrubs of pliant habit are quite suitable for use on a pergola. The field of choice is therefore so large as to be confusing unless some clear principle of arrangement is followed. Most climbing plants when really happy make up in luxuriance what they lack in backbone. Overcrowding leads to a muddled effect, and it is better to exercise restraint in planting.

Many climbers are so pliable that with proper care they can be trained almost at will, and the form of the pergola can either be defined or a massed effect produced where the composition of a picture so requires.

Every pergola should have some individuality of its own, but its first duty is to play its part in the larger views of the garden. If it can simultaneously score some good side effects in conjunction with neighbouring planting details, so much the better. The interior of the pergola belongs to itself, and if happily treated will quite dispose of the fallacy that a pergola is only worth looking at from the outside.

The desire for great masses of colour is rather overdone. I think it is a mistake when a pergola occupies a prominent position to limit its reign of glory to a comparatively short burst of Rose bloom. If other plants are also introduced in which the tints and texture of the foliage are considered, the sum of the season's enjoyment is considerably increased. Density of foliage at calculated points is important in producing effects of perspective, and the flecks of sunlight and bars of shade on the pergola floor give character to the interior. A heavy evergreen at the entrance will make an inviting contrast with the outside glare, or a good result follows the planting of a rampant climber, such as a vine, which will sprawl over the first arch and clutch also at some architectural feature to which the pergola is keyed. Planting which helps to unify a pergola with its surroundings serves a good purpose.

I remember an instance in a Devonshire garden where a sturdy Fuchsia was growing on a pier and looked as if it had stepped from a large adjoining group of these shrubs to make acquaintance with the pergola. Through the arches of the latter one saw a bank of Heather sloping to the foot of the piers. The pergola was planted almost entirely with claret-leaved Vine and reddish-purple Clematis. A pink Rose or two and the large mass of Fuchsias close by gave the whole thing a very warm and comfortable effect.

It is scarcely necessary for me to re-enumerate the many plants which are so often recommended. The most favoured are perhaps the varieties of Vine, Rose, Clematis, and Wistaria.

Vines are most useful when shade is required for its own sake, and everyone knows the beauty of the autumn tints of such species as *Vitis Thunbergii*, *Coignetiae*, *Henryi*, and others. Clematis is, I think, almost my favourite plant for pergolas. The more rampant species, such as *montana*, *Flammula*, and *Vitalba*, are such honest hard workers and their habit is so graceful. Other beautiful sorts are insufficiently used. I give below a selection kindly furnished me by Mr. A. Jackman.

Roses for the pergola have already furnished material for many a chapter, and I need not enter upon this big subject. I give a list of Roses Mr. G. Paul is good enough to recommend.

The Wistaria at its best is unbeatable. The graceful foliage, beautiful flowers, vigorous growth, and picturesque stems, make it perhaps the most striking of all plants for a pergola.

An unusual advantage of the Wistaria is that the interior of a pergola gets the benefit of a good share of the blossom. The white-flowering varieties show up extremely well, and a combination of mauve Wistaria and Laburnum is very effective. The vigour of Wistaria is astonishing. There was, and no doubt still is, at Cold East, in Devonshire, a great plant entirely monopolizing a pergola crossing the whole width of the kitchen garden.

Fragrance must not be forgotten, nor the virtues of Honeysuckle and Jessamine in this respect.

I conclude with a reminder concerning fruit trees for pergolas, and give below a list of Apple and Pear trees recommended by Mr. Allgrove as most suitable :—

FRUIT TREES FOR PERGOLAS.

Dessert Apples.

| | |
|---------------------|----------------------|
| Beauty of Bath. | Cox's Orange Pippin. |
| Langley Pippin. | Adams's Pearmain. |
| James Grieve. | Allington Pippin. |
| Lady Sudeley. | Wealthy. |
| Worcester Pearmain. | King of the Pippins. |
| Christmas Pearmain. | Fearn's Pippin. |

Cooking Apples, possessing size, colour, and quality.

| | |
|-----------------------|---------------------|
| Emperor Alexander. | The Queen. |
| Bismarck. | Lord Derby. |
| Cellini Pippin. | Warner's King. |
| Cox's Pomona. | Newton Wonder. |
| Lane's Prince Albert. | Bramley's Seedling. |
| Peasgood's Nonesuch. | Rev. W. Wilks. |

Pears.

| | |
|-------------------------|--------------------|
| Williams' Bon Chrétien. | Marie Louise. |
| Clapp's Favourite. | Pitmaston Duchess. |
| Marguerite Marrillat. | Thompson's. |
| Louise Bonne of Jersey. | Doyenné du Comice. |
| Conference. | Emile d'Heyst. |
| Triomphe de Vienne. | |

ROSES FOR PERGOLAS.

Autumn-Flowering Noisettes.

| | |
|----------------------|--------------|
| Alister Stella Gray. | Mme. Cochet. |
| Aimée Vibert. | Rêve d'Or. |

Hybrid Noisettes.

| | |
|----------------------|------------------|
| Paul's Single White. | Zéphyrin Drouin. |
|----------------------|------------------|

Climbing Hybrid Perpetuals.

| | |
|------------------------------|-----------------------|
| Climbing Frau Karl Druschki. | Climbing Rodocanachi. |
|------------------------------|-----------------------|

Climbing Hybrid Teas.

| | |
|----------------------------|----------------------------|
| Climbing Richmond. | Climbing La France. |
| Climbing Caroline Testout. | Climbing Mrs. W. G. Grant. |

Cluster Roses, Wichuraianas, &c.

| | |
|----------------------|-------------------|
| Shower of Gold. | François Guillot. |
| Paul Transon. | Gerbe Rose. |
| Albéric Barbier. | Paradise. |
| François Juranville. | American Pillar. |
| Réné André. | Tea Rambler. |
| Léontine Gervaise. | Blush Rambler. |

For Foliage, Single Flowers.

| | |
|---------------------------|-------------|
| rubrifolia. | Brunonis. |
| Reine Olga de Wurtemberg. | himalayica. |

CLEMATIS.

Spring.

| | |
|---------------|----------------------|
| Miss Bateman. | Sir Garnet Wolseley. |
| The Queen. | Robert Hanbury. |

Summer.

Beauty of Worcester,
Fairy Queen.
Henry.
Lady C. Neville.

Lord Neville.
Marie Boisselot.
Mrs. Hope.
Nelly Moser.

Autumn.

Comtesse de Bouchard.
Gipsy Queen.
Jackmanii.

Mrs. Cholmondeley.
Star of India.
Ville de Lyon.

Small-Flowered.

montana rubens.
montana superba.
Viticella alba luxurians.
V. Kermesina.

Admiration.
Countess of Onslow.
Duchess of Albany.

SCHOOL GARDENING.

By RONALD C. S. ROSS, F.R.H.S.

THE increasing importance of the whole art of gardening, and the necessity of improved methods of cultivation throughout the country, have raised the school garden to the level of a real national asset. As such it should to a great extent serve as an experimental station for the locality, both in regard to manuring and cropping. The observation and recording of garden pests—the earliest time of appearance, season of greatest prevalence, attacks on species of plants not usually associated with a particular pest (*e.g.* the rosy rustic moth caterpillar (*Hydroecia micacea*) on the potato in 1917), conditions of weather, methods of treatment, &c.—would be invaluable in preventing widespread destruction of crops. Obviously the best time to check an outbreak is at its beginning, so that early warning would be obtained from these data.

Experimental work in methods of combating insect and fungoid pests, the cultivation of new varieties of vegetables (*e.g.* Dutch Brown Bean, Potato Majestic) for testing yield, quality, and hardiness under local conditions, should also be undertaken, and the results, when clearly established, placed before allotment and garden holders in the vicinity.

Management.—Garden classes cannot always be on the land at the hour allotted by the time-table, any more than one can perform all gardening operations by calendar, and no attempt should be made to keep blindly to either. Weather conditions alone ought to cause postponement of one week's work to another. Advantage should always be taken of soil condition for transplanting, seed sowing, and the like.

All work should be the result of reasoning. Rule-of-thumb methods do not lay the foundation of sound horticultural principles, which is the aim of school gardening. If possible, amalgamation as a junior branch with a local gardening association should be attempted. In this way the value of co-operation in the purchase of tools, manures, seeds, &c., and the disposal of surplus produce would be learnt in a practical manner.

As a grant-earning subject the special year begins on November 1, but a preliminary course might well commence in March or April: though November, or a little earlier, is the best time to break up grass land. The number of scholars taught at one time is limited by the Code to fourteen, aged eleven and upwards, and practice proves that a much greater number is not advisable. Girls need not be excluded from the classes. Younger children and infants find pleasure in bulb-

growing and flower borders, and at the same time gain some ideas of the later work.

The Garden.—The garden should, if possible, have an open, southern aspect, sheltered from north and east winds, with soil of medium consistency—neither too heavy nor too light—and fairly deep. For supervision and access it is best situated within a few minutes' walk of the school. From twenty to thirty rods would be a convenient size for a small school. It may be remembered that the common weeds in the plot give some indication of the soil and its drainage. Generally speaking, there is little choice of ground, but the foregoing points are worth bearing in mind.

If there is no protection against the cold winds, a permanent hedge can be rapidly grown if Myrobalan plum is planted.

A lock-up shed for tools—at any rate a rough shelter against the weather—should be erected.

Reasonable security of tenure is necessary.

Garden Requisites.—The tools—a little less than full-size where younger scholars are to receive instruction—should include spades, forks, hoes (draw and Dutch *), rakes, lines, a wheelbarrow, one or two gallon watering-pots, tubs for sprays and liquid manure, a sprayer and various sundries.

Planning the Garden.—As this depends upon shape, size, and position, no definite plan suitable for every garden can be given, but as a rule a one-rod plot for each child gives better results than somewhat larger plots shared by two or more children, though the latter are an improvement upon a garden worked by all the children in common. There should, however, always be one common plot, in which a large variety of vegetables would be grown; also a small experimental plot, and fruit and flower plots. Still smaller places should be marked off for a frame, rubbish and bonfire heaps, compost heaps, &c. Nursery beds can be made on sheltered spots, and room for permanent crops like rhubarb, asparagus, and certain herbs reserved.

Management.—Two lessons of one, or one hour and a half each weekly are found more useful than one longer one. They are probably best taken at the end of morning or afternoon school. Cropping should invariably be in rotation, and the rows should run as nearly as possible north and south.

It is a great advantage if a few minutes preceding the actual garden work can be devoted to a discussion of the coming operations, and the actual work done recorded immediately afterwards in special notebooks while fresh in the minds of the children. These books should contain diary, plans of the whole garden, plans of individual plots drawn to scale to show cropping, table of seeds sown, quantities of produce, income and expenditure, and notes of insects, &c., observed. Experiments, and diagrams of operations are too useful to be omitted.

Tools must be cleaned after each time of using, and arranged

* The "Caxton Cultivator," with three teeth, is an excellent tool for light and medium soils.

in good order. Work will be easier, and the life of the tools prolonged.

For the holidays a rota of boys should be chosen to keep weeds down and to stir the surface soil by hoeing. A small plot might well be left without attention as an object-lesson in the value of the constant use of the hoe.

The instructor, preferably a schoolmaster, enthusiastic and with sound knowledge of horticulture, will produce similar enthusiasm in his class. A certificate in school gardening is granted to teachers on examination by the Royal Horticultural Society, and another "Certificate of Diligent Interest in Plants" is given to the winners of school competitions.

If a section of the local Vegetable Show can be reserved for the school children it gives a wonderful impetus to the work, or a small competition among the plot-holders may be preferable in some cases. The exchange of gardening journals brought from home, the use and distribution of pamphlets issued by the Royal Horticultural Society, are invaluable means of awakening a love of garden craft and a sense of the importance of technical works. These pamphlets should play a great part in extending general garden knowledge.

Instruction will avoid the repetition of local mistakes, such as the use of potato haulm (which should always be burnt) for covering potato clumps. The burning of all diseased vegetation immediately is a habit which must never be neglected, and continually impressed upon the children. Wide-spaced planting of well-sprouted sets, rejection of doubtful seed, careful earthing up, and spraying with Burgundy or Bordeaux mixture as means of preventing disease and increasing the yield of that most important crop, the Potato, would do much to bring about better methods of cultivation in the neighbourhood.

Experimental Work.—A scheme which includes the following as a basis has given good results. Seeds: seed saving, testing, germinating, sowing. Soil: composition, tests for lime. Potatoes: cut and uncut sets, sprouted and unsprouted sets, unlimited sprouts and sprouts limited to two and three shoots, spraying. A small plot left unsprayed shows the increased value of the sprayed crop. Cultivation: digging, double digging, and trenching, natural and artificial manures, &c. Fruit: pruning, grafting, &c.

Insects, Birds, Fungus, &c.—The beneficial insects and something of their life-histories, as well as of the harmful ones, should be known and easily recognized. The influence of bird life on the economy of the garden when properly understood checks the slaughter of valuable allies and the stealing of their eggs. Fungus pests should be noted. Such problems as seed dispersal and plant growth assist vegetable cultivation and the suppression of weeds. Collections of harmful insects and dried and pressed weeds are easily formed. By means of drawings in colour permanent records can be made where it is not always possible to preserve the actual specimens.

The indiscriminate and ignorant slaughter of insects and birds is to be deplored, and the wise teacher will see to it that the friends of the garden are known and protected.

Handwork &c.—Sprouting-boxes, wooden pegs and labels, fences, or more ambitious work like shed-building or frame-making are useful adjuncts. Simple repairs, too, offer a field for enterprise.

Modelling in plasticine and wax, or potter's clay which can be painted in water-colours, is a valuable means of recording the ever-changing interests of gardening, seed germination, perfect vegetable growth, the effects of insect and fungus attack, &c.

Various sections of the R.H.S. pamphlets can be simply bound to act as class text-books; and diagrams of vegetable food values as compared with meat add to the knowledge and interest of the actual garden work.

It is sometimes possible to combine bee-keeping with the work of the school garden; and, though strictly speaking outside the sphere of garden craft, poultry and rabbits can be profitably kept. Giant sunflowers would then be grown for seed.

In Conclusion.—The question as to whether girls should receive equal instruction in gardening with that given to boys lies at the discretion of the school authorities, but the labour of women on the land and the success of women gardeners, together with the lasting need of food production, make it impossible to deny its desirability.

The suggestion that whatever work is undertaken ought to bear largely upon the special conditions and requirements of local horticulture, though not to the entire exclusion of outside considerations, is obviously a correct one. The pupil must have knowledge of home requirements, but, apart from food production, the aim of school gardening, while always educational, is to provide a broad survey and practical appreciation of the work likely to be met with in any allotment or cottage garden in any part of the Empire.

SCHOOL GARDENING: A CORRELATION.

By M. A. FAYERS, F.R.H.S.

MODERN critics have long persistently attacked our system of elementary education by denying its practical usefulness. They say that children, especially boys in our rural districts, waste much precious time, which would be more profitably employed in the field or garden learning to follow in their fathers' footsteps as skilled farm labourers or gardeners. They say that much of the curriculum is absolutely useless; that their fathers did very well without nature study or elementary science, and that much of the matter taught is actually detrimental to their future. They complain that children remain too long at school, acquiring a dislike for an agricultural occupation, and declare that this is the chief cause of the scarcity of labour in many rural districts.

This conception of the matter is largely due to a distorted view and an imperfect knowledge of the scope and aims of the subjects so decried. The idea that the success of preceding generations in agricultural operations was not *in spite of* lack of scientific knowledge, but *because of* it, is a fallacy which must be exposed at the outset. When a man who disclaims all aid from "book-learning," as he scornfully calls it, acts upon the results of careful observation—either his own or that of others—he is a scientist, though he may not know it. He is employing the scientific processes of induction and deduction, though he may never have heard of them.

The modern system of education merely seeks to regulate and utilize the natural tendency to observation, which is such a precious gift in childhood. It does not ignore the probabilities of future employment, but aims at making that employment more interesting and attractive, by explaining those empirical laws which have been accepted by their forefathers as a matter of course; by experimentally proving the truth of such laws; and by encouraging individual efforts to obtain knowledge at first hand. In effect it aims at unfolding the whole field of systematized knowledge, embodied under the idea of "a science," stage by stage, from earliest years, so that the day school pupil may look forward with pleasurable anticipation to the more advanced class of the continuation school. Constant reference is made to agricultural events occurring around the school, with the special view of inviting questions on simple operations; and in this way school life is correlated with home interests.

A profitable school curriculum planned upon these lines should lead up to practical use in:—(1) the daily occupation, (2) the allotment to be cultivated in leisure hours, (3) the small holding upon which the skilled horticulturist ventures his savings.

Such a course should embrace the following features in the elementary school :—

Co-ordination of the following subjects :

- (a) Gardening.
- (b) Science.
- (c) Geography (importation of plants, alluvial deposits).
- (d) History (introduction of plants as Food and Medicine).
- (e) Arithmetic (weighing, measuring, planning).
- (f) Drawing.
- (g) Composition (summary of Theory and Practice). Note making.

Gardening affords excellent opportunities for :—

1. Experimental science teaching. The proof is afforded (of proof from deduction) from experiment on a larger scale than is possible in the schoolroom. Full and independent observation is fostered.
2. Nature study in the garden embraces :—Observation of animal and plant life, natural phenomena, elementary geology, all of which are treated in a spirit of scientific inquiry.

| THEORY. | PRACTICE. |
|---|---|
| <i>Seed.</i> | |
| Structure. | Preparation of ground. |
| Functions. | Favourable conditions of soil, temperature, environment. |
| Requirements for growth. | Experiments. |
| <i>Soil.</i> | |
| Formation. | Co-ordination in garden. |
| Movement. | Hoing, manuring, and dressing. |
| Drainage. | Experiments. |
| <i>Root.</i> | |
| Structure, functions, kinds. | Illustration by means of edible garden roots. |
| Use of various kinds. | Layering, cuttings, experiments. |
| Vegetative reproduction. | |
| <i>Stem.</i> | |
| Growth. | Sketches. |
| Buds. | Explanation by experience in pruning, thinning-out, budding, and grafting. |
| Habits. | |
| <i>Leaf.</i> | |
| Parts. Functions of parts. | Illustrate in garden. |
| Fall. Formation of absciss layer. | Edible. Use of climbing habit. |
| Use as manure. | Utilization by gardeners of leaf habits. |
| | Experiments. |
| <i>Flower and Fruit.</i> | |
| Use, means of fertilization. | Observations in garden. |
| Attractive devices. | Flowers we eat. |
| Protective measures. | Experiments. |
| <i>Seed-sowing.</i> | |
| Reasons for method in preparation of plot, box, or pot. | Sow seeds. |
| | Keep records of growth. |
| | Experiment. |
| <i>Methods of Reproduction.</i> | |
| | Practise cuttings, layering, seed-gathering. |
| | Understand the principles of budding and bending. |
| To keep the garden constantly gay. | Lay out the garden. |
| Plans of cultivation. | Work from list, so that colour is constantly present. Alternation of flowers. |
| Lists of plants. | Constant succession of seedlings. |

THEORY.

Methods of Reproduction—continued.

Theory of operations.
 Danger of watering.
 Advantages of watering.
 Care of fruit-trees.
 Pruning.
 Proper methods of gathering and packing fruit.
 Principles of the preservation of fruit.
 Knowledge of garden enemies and friends.
 Knowledge of simple insecticides and fungicides.

PRACTICE.

Garden operations.
 Planting and transplanting.
 Experiments.
 Winter and summer culture.
 Experiments in right and wrong methods.
 Practice in jam-making, jellies.
 Bottling fruit.
 Discrimination between enemies and friends.
 Early use of remedies.

GENERAL METHOD.

Records of weight and measurement to be kept. Improvement in crop and type.

Effect.—Deduction of laws regulating health and growth of plant life through comparison.

If any crop in the district shows marked success or failure, the pupils should be encouraged to form and prove—as far as possible—hypotheses as to the cause of the special results noted.

Friendly rivalry between the boys and their fathers and mothers may be encouraged, by allowing pupils to take home a part of their seed. Note to be taken of the variation in results (if any), and inquiry made as to how far such has been caused by (*a*) variation in soil, (*b*) aspect of garden, (*c*) methods of cultivation.

A course of instruction in gardening for girls is advisable for the following reasons:—

1. In a small-holding much light gardening work can be done by women, so as to free the men for more strenuous labour and thus lighten the working expenses.

2. Experience has proved that few emigrants have time to devote to the raising of vegetables. When the wife or sister understands the principles of horticulture, common vegetables can be raised on a colonial homestead without encroaching on the time of the stock-man or wheat-farmer.

3. Gardening in its lighter forms can be profitably pursued by girls, and a substantial increase made to income by growing salad plants, flowers for market.

4. Where a small plot is available for bush-fruit, instruction can be given in packing fruit for transit; and the principles of jam-making, and the preservation of fruit by bottling, could be taught.

CORRELATION OF SUBJECTS.

Arithmetic.—Problems dealing with proportion of sugar to fruit, average time, cost, &c.

Market price of flowers, vegetables.

Return minus commission.

Proportion of capacity to weight in various fruit crops. (Packing.)

Composition.—Dealing with processes taught ; original observation and experience.

Science.—Suitable soils, action of water, aspect for special classes of flowers, soil texture, light, air, warmth.

CONTINUATION SCHOOL.

Abnormalities of plant life met with in the garden form interesting subjects for discussion at Gardeners' Meetings or Evening Classes. The great aim of any class in this subject should be to make the acquisition of knowledge dependent on the students' own observations, to make original sketches illustrating the experiments which they themselves set up and to write original notes, explaining the objects of the experiments, describing the results and drawing inferences from them. Chemical analysis could be made of the tissues of plants, with a view to the discovery of their constituents, in order that plant foods suitable for their individual needs may be supplied. Graphs showing in a picturesque form the proportion of the principal food stuffs found in typical plants might be drawn up so that the student might, at a glance, estimate the relative value of the various species of plants under cultivation ; a very important matter when the cropping of a limited area is under consideration.

The study of such subjects might be made more interesting by frequent use of lantern illustrations, which might very well reproduce many of the students' own observations. The special advantages to gardeners of such a course of study are obvious. All practical work, if it is to be really successful, *demands* scientific knowledge, and accurate information based on correct principles. This knowledge is best gained by experimental observation, under expert guidance. The gardener who is equipped with this scientific knowledge is more likely to achieve success than one who relies upon tradition and "rule-of-thumb" methods. He understands the best conditions for securing good crops, and, more important still, by realizing the importance of those conditions and the forces which produce them, he is often able to modify the environment of the plants under his care, so as to produce the very conditions conducive to their welfare. It is too costly and tedious a business to experiment in the garden—this must be done in Night School or Laboratory.

The value of poultry and pigs as an adjunct to the garden should be taught, practically if possible—if not, theoretically.

1. Droppings = concentrated manure of great value.
2. Use for garden refuse.
3. Fowls kept on a neglected piece of garden for a short time speedily clear it of weeds, and by their droppings convert it into a valuable plot suitable for immediate cultivation. This matter can be correlated also with ordinary school work by :—

1. Oral lessons followed by practical observation.

2. Experience at home or in experimental fowl-run attached to the school.

The value of bees as pollinating agents in a garden should be noted. Where possible, beehives should be kept in the school garden, and practical instruction given on their management.

A course such as this should be of material help to the small-holder, who has, as a rule, a limited income to work with, and needs therefore to employ those methods which will give the maximum of success and the minimum possibility of failure. He cannot afford to experiment on his holding; if he is wise, he will gladly welcome any opportunity of doing so without expense to himself. Such an opportunity is given in a course of experimental science dealing with plant life in all its phases, given by an expert upon the subject.

PLANT DISEASE AND THE "VICIOUS CIRCLE."

By JAMIESON B. HURRY, M.A., M.D.,

Author of "Vicious Circles in Disease."

A Vicious Circle in pathology is defined in Murray's English Dictionary as "a morbid process consisting in the reciprocal continuation and aggravation of one disorder by another." This process plays a rôle of great importance both in animal and in vegetable pathology, especially in the higher members of the two great kingdoms of living things in which there is differentiation of structure and function.

Throughout life there is a constant process of reciprocation taking place between various organs and functions. Thus in animals the nervous, the cardio-vascular, the respiratory, the digestive, the renal and other systems are intimately associated with each other, their functional activities being harmonized by an all-controlling nervous system, increased or diminished requirements in one direction being balanced by the necessary adjustments in another. Moreover, a swiftly circulating fluid by means of a self-regulating mechanism supplies to each tissue the quality and quantity of nutriment required, while waste products that would clog further activity are removed.

The corresponding correlations as seen in plants are less obvious than they are in animals. There is neither an all-controlling central nervous system, nor a rapidly circulating nutrient fluid at all comparable with the blood. Nevertheless, in principle the phenomena of correlation are the same as those in animals, and are governed by protoplasmic stimuli connecting every part of the organism with every other part.

This applies to the shoots, leaves, cortex, cambium, roots—in fact to every organized structure, although the inter-dependencies are more intimate in some cases than in others. Thus both in animals and in plants the vital mechanism is carried on by means of a ceaselessly operating chain of complex and reciprocal interactions.

Even within the limits of health there is frequent disturbance of the harmonious co-operation between various organs. Such disturbance, however, rapidly provokes reactions which remove the source of irritation and restore the natural state of equilibrium. If the disorder is too severe to be repaired by physiological reactions the condition passes into one of disease.

Disorder in one organ is then apt to awaken disorder in other organs, which in turn reacts injuriously on the first, so that a sequence of pathological correlations is established. Thus in the case of the animal cardiac disease affects the nervous, the respiratory, the digestive

and other systems sympathetically, and these secondary disorders in their turn injure the organ primarily affected. Thus is the *circulus vitiosus* established. Doubtless to some extent one organ can give vicarious assistance to another in difficulty. But this power of relief is limited since there is no great provision of reserve.

In the diseased plant similar injurious interdependences are observed.

A common illustration is afforded by root starvation leading to an inadequate supply of nutritive material to the assimilating leaves. Their metabolic activity is impaired, and such impairment reacts injuriously on all other organs. Growth and development are checked and there is less material to transport. Further root starvation takes place, and the sequence of events is repeated and intensified.

A similar concatenation of injurious factors may start from any other tissues. If the leaves of a plant are so feebly illuminated that assimilation is reduced to a minimum, far-reaching results obtain. The stem remains thin; the development of the cambium layer is checked; the supplies of nutriment passing to the roots are insufficient for their growth and for the formation of new root-hairs. Absorption of water and salts is interfered with, and this in turn further curtails the functional activity of the leaves. Here also is established a mutual causal relation between disease of various organs.

There is, however, a striking difference in the manifestation of the morbid process in animals and in plants.

In animals, owing to the higher differentiation of organs, numerous specific *circuli vitiosi* are met with, and fresh examples are frequently discovered. Thus disease of the blood provokes disease in other tissues, which in their turn pour products of perverted activity into the blood, and it is possible to study this endless chain of disorders link by link.

Future research may yield similar processes in plant pathology. But at present specific effects of morbid reactions are almost a *terra incognita* owing to lack of detailed knowledge of functional disorders in plants apart from those caused by attacks of parasites. On the other hand, the general principle is in universal operation, manifesting itself not by specific results but by the production of a lowered resistance to morbid agencies, and playing a part of great importance in the growth and life-history of the plant.

It may be of interest to summarize briefly some causes of lowered resistance, and then to discuss its effects. Immaturity of tissue is a common cause of impaired resistance. The epidermis in early life is both tender and thin, and may be penetrated by bacteria or fungi that are powerless to injure plants whose epidermis has become cuticularized or replaced by cork. On the other hand, advanced years also predispose to infection. In young coniferous trees well provided with resin canals injuries in the cortex are at once sealed by an exudation of turpentine and thus protected from wound fungi, while in older trees turpentine and resin are less freely exuded as

styptics. Again, wounds are more slowly occluded by callus in old age than in youth. Such predisposing factors enable many organisms successfully to effect an entrance and to weaken the host further. According to recent researches by APPEL, excess of air in the tissues associated with insufficiency of water is another common cause of lowered resistance.

Parasitic invaders may abstract their food from the host-plant by various methods. Some ramify in the intercellular spaces and middle lamellae; others send haustoria into the actual cells. Many secrete enzymes or toxins which destroy cells or cell-walls, the materials of which then promote further growth and proliferation of the parasites. Hence fresh enzymes or toxins are secreted for the destruction of remoter cells, which in their turn fall a prey to the ever-spreading invader. Thus the morbid process *vires acquirit eundo*.

The effects of circular reactions may be briefly discussed under three headings: (I.) The Perpetuation of Disease; (II.) The Destruction of Organs; (III.) The Termination of Life. These groups, however, are by no means sharply defined; diseases placed in I. and II. may under exceptional conditions prove fatal, while diseases placed in III. may be so chronic as scarcely to shorten the duration of life.

I.—THE PERPETUATION OF DISEASE.

The perpetuation of a disease through insufficient chlorophyll assimilation has already been referred to. In other cases the morbid process may be initiated by living organisms.

Both the true fungi as well as Schizomycetes (Bacteria) and Myxomycetes (Slime Fungi) may be concerned.

Peridermium Pini.—A striking example may be found in the case of pine-blister caused by *Coleosporium senecionis* (*Peridermium Pini* var. *corticola*), a fungus which attacks the cortex of the Scotch and Weymouth pines amongst others. The hyphae grow in between the green cells of the cortex as well as in the bast-tissues, and may even penetrate the medullary rays and resin-canals. Other hyphae pierce the cells, consume the starch and other food stuffs, and cause a serious loss of resin which both soaks into the wood and exudes from the bark. This loss of resin involves a serious impairment of vitality. Moreover, the effusion of turpentine into the wood interferes with conduction in these tissues and lowers the nutrition of the tree, especially above the point of attack, since the flow of sap is checked.

Meanwhile the parasite nourishes itself on the juices which it has liberated and on the contents of the cells it has invaded. Thus a struggle takes place which may last for many years. If the tree is vigorous it may, by the diversion of metabolic material, form sufficient cork to shut in and suffocate its enemy. But as a rule the invader extends its ravages and converts a robust thriving tree into a dwarfed sickly one. The more the parasite can arrest the flow of sap and the greater the loss of resin the more is vitality impaired, and the less the vitality the more rapid the progress of the invader. Cause and

effect aid and abet each other, and the result is a chronic invalidism of an enormous number of trees that are attacked by this disastrous disease.

A similar process is frequently observed as a result of bacterial invasion. Erwin F. Smith has described a number of leaf-spot diseases in which the parasite penetrates through stomata in the unbroken leaf and stem surface, and multiplies in the substomatic chamber, causing a local destruction of tissue. Thus *Bacterium Phaseoli* is responsible for the spot disease of beans, *Bacterium maculicolum* for the spot disease of cauliflowers, and other examples have been observed. Leaf spots are often slow in their progress and confined to small areas, the reason probably being that the vascular system is not invaded. Nevertheless, the bacteria weaken the cells of their host or destroy them altogether. With increasing supplies of food and a nidus rendered alkaline by their own excretions, the bacteria multiply more and more, unless indeed, as sometimes happens,

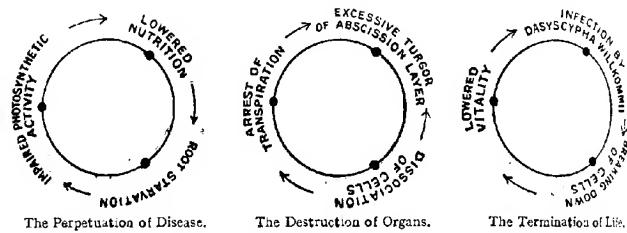


FIG. 49.—PLANT DISEASE AND THE "VICIOUS CIRCLE."

the host can arrest the morbid gyration by separating the diseased from the healthy tissues by the formation of a corky layer.

II.—THE DESTRUCTION OF ORGANS.

Another result of an injurious circular reaction is the destruction of an organ either by a non-living or a living agency.

The action of a non-living agency is illustrated by the premature shedding of leaves or of twigs which may be thrown off in great numbers as a result of organic tissue changes.

The disorder is most often observed as regards leaves, and is initiated by an impairment of assimilation and transpiration processes as a result of which the suction force by which under healthy conditions the sap is drawn up is lost. Consequently the sap accumulates in the basal leaf zone through which the line of cleavage ultimately passes, and which becomes excessively turgid with osmotic materials. This turgor stimulates to premature activity the dormant cells of the abscission layer; the partition wall between adjacent cells swells and a process of dissociation is inaugurated. The result is a further impairment of vitality in the leaves, culminating in complete detachment. To quote SORAUER: "Every premature shedding of leaves

is due to a disturbed equilibrium in the distribution of turgor." In other words, the process of premature cleavage is due to an arrest of metabolic activity causing pathological turgor at the basal zone followed by a progressive loss of activity.

A similar process accounts for the premature shedding of twigs or shoots which may occur as early as July. The oak and the poplar are frequently affected, the ground being in some cases thickly strewn by the detached twigs.

The destruction of organs may also be due to the attacks of parasites, some of which display a preference for certain organs, such as leaves, twigs, tubers or buds. A lowered state of vitality predisposes to such parasitic invasion, which then further lowers nutrition, culminating in the total destruction of the organs.

1. *Lophodermium Pinastri*.—As an example of a parasitic leaf-shedding disease may be mentioned the Pine Needle-cast caused by the fungus *Lophodermium Pinastri*, also called the Pine Leaf-scurf or leaf-shedding fungus.

The disease chiefly attacks the young and tender leaves of the Scots and Austrian Pines and other Conifers, and may cause many of their leaves suddenly to wilt and drop. The needles when first attacked are merely speckled with brown spots containing the mycelium of the fungus. But in the following year they wither, turn red or brown and die off in hundreds. This loss of leaves seriously weakens the plants and thus hastens the progress of the disease. The greater the loss of foliage the less the power of resisting infection. It is for this reason that the parasite is most destructive in shut-in valleys or low-lying situations, where the trees possess least vitality and consequently succumb most readily.

2. *Ustilago*.—The destruction of plant organs as a result of the *circulus vitiosus* is also illustrated by the action of the cereal smuts (*Ustilago*), which attack such grains as are rendered liable to infection by lowered vitality. The smuts reduce the ovules to a black powdery mass of spores, which are carried away on the wind or otherwise dispersed, leaving nothing but the bare axis on which the flowers were originally situated.

III.—THE TERMINATION OF LIFE.

Many examples might be given of the death of a plant as a result of the morbid process under discussion. One fatal disease due to a fungus and one due to a bacillus may be referred to.

Dasyscypha Willkommii.—The well-known larch canker, associated with the *Dasyscypha Willkommii*, is an example of a fungus disease which is responsible for the loss of an enormous number of trees in our woodlands. The larch is indigenous in the Alps, where there is a long winter season, followed by a short or no spring, and by a short hot summer. Owing to the rapid transition from winter to summer the larch buds open very rapidly when once they start. Hence the period during which the foliage is young and tender and susceptible

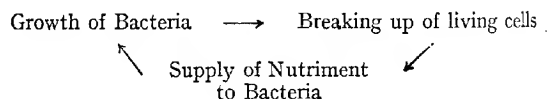
to attack is very short, since the tree passes rapidly into its summer state with its increased power of resistance. When, however, the larch is planted in such a country as England, with a mild winter and a long and damp spring, the period of foliation extends over six or eight weeks, instead of two as in the Alps, so that insects and fungoid enemies have a much longer period during which to do damage.

One of the great enemies of the larch is the fungus *Dasyctypha Willkommii*, which effects a lodgment in wounds in the young leaves and shoots made by plant-lice (*Chermes laricis*) or the mining-moth (*Coleophora laricella*), or by some other injury which breaks the surface continuity. In such a wound the spores find a favourable nidus, whence the mycelium penetrates into the cortex during the quiescent period of winter.

If the tree has sufficient vitality it may succeed during the period of active growth in cicatrizing the canker-spot by surrounding the blister by a tough corky layer and thus arresting its progress.

But under less fortunate conditions, when autumn returns, the mycelium penetrates further into the cambium and enlarges the canker-spot. Eventually it reaches the wood and interferes with the flow of sap. The further the invader advances the more is the resisting power of the host plant weakened, while such loss of resistance quickens the progress of the fungus. In course of time the tree sickens and dies.

Bacterium Hyacinthi.—The yellow bacteriosis of hyacinth bulbs may serve as an example of a specific and fatal bacterial disease, being due to *Bacterium Hyacinthi*. Healthy bulbs are rarely attacked; but if a wound or other condition has impaired vitality infection readily follows. The sequence may thus be represented:



In the early stage of bulb infection the disease is confined to the vascular bundles, from one to fifty of these being yellow and full of bacterial slime. But at a later state the disease spreads to the intervening parenchyma, and finally the whole bulb is destroyed.

These examples of injurious circular reactions in phytopathology might be indefinitely multiplied. But they suffice to indicate the operation of a wide-spread principle. The process belongs to those fundamental biological phenomena which are common to both the higher animals and plants. Within the limits of health organization is of unquestioned advantage. But the liability to pernicious and reciprocal correlations is a serious penalty paid for such organization when physiological processes are disturbed by disease.

The simpler organization of plants probably explains why this complication of disease is so much less specific than it is in zoopathology. Another reason is that in animals every organ is fully developed and performs its functions almost to the utmost, while in the plant, on the other hand, there are always present the rudiments of new organs as well as reservoirs of reserve materials, and each of these provisions can assist in making good any failure of functional activity. A further explanation may be found in the more intimate union of cells in the animals as compared with the plant allowing of closer interdependences.

Apart from these reasons, however, there can be little doubt that with the growth of our knowledge of correlations in plants many examples of specific *circuli vitiosi* remain to be discovered. A further proof will thus be supplied of the essential unity in the laws governing animal and vegetable pathology.

Lastly, the study of Vicious Circles contributes to scientific horticulture. It should indeed be a cardinal principle of the treatment of plant diseases to interrupt injurious circular reactions at the earliest possible moment. The smallest help afforded at the right moment may arrest the progress of disease and break the sequence of the destructive factors. If a beginning is once made, the *vis medicatrix naturæ* may once again become operative and complete the processes of repair. In the words of a famous therapist, Sir LAUDER BRUNTON: "We must see where the Circle can best be broken, since if we break it at one point we allow recovery to commence."

REPORT ON METEOROLOGICAL OBSERVATIONS AT
WISLEY, 1917.

By R. H. CURTIS, F.R.H.S.

THE present is the Fourteenth Annual Report on the Meteorological observations made at the Society's Climatological Observatory in the Gardens at Wisley, the daily readings of the instruments having been continued without a break since the beginning of 1904. To the horticulturist the outstanding feature of the weather of 1917 was the unusual intensity and persistence of the cold which prevailed throughout the first four months of the year, and also during the closing four weeks. During the whole of these five months the temperature was much below the normal (see fig. 50); and although, later on, this was to some extent balanced by the warmth of summer, yet it sufficed to bring down the average temperature for the year to considerably below the normal point. Taking the seventeen weeks comprised in the first period, January to April, there was but one week which could be regarded as seasonably warm, whilst eleven were phenomenally cold, and the other five also cold, but to a lesser degree. As regards rain also—another all-important climatological factor to the gardener—whilst in most districts the total fall for the year did not differ greatly from the usual amount, its distribution over the twelve months was unusual. The early, cold, months were also very dry ones; but July and August were remarkably wet; and in June there occurred in London, and also in Somerset, local downpours of rain of extraordinary—and indeed, so far as the records go, of unprecedented—violence. During the winter months snow fell rather frequently, and occasionally the falls were large, although as a rule they were noticeable rather for their frequency than for their intensity. At Wisley more or less rain fell on one hundred and thirty-seven days, and snow on twenty-two days. A somewhat smaller amount than usual of bright sunshine was registered generally, and at Wisley the recorded total duration amounted to only one-third of the time the sun was above the horizon, so that the year cannot be regarded as a bright one.

The chief climatological features of the year of immediate interest to the horticulturist can be at once appreciated by reference to the four diagrams which accompany this Report. In fig. 50 is shown, for each month of the year, the amount by which temperature and rainfall exceeded or fell short of the average. Fig. 51 indicates for each month the mean temperature of the air, and of the soil at depths of one foot and four feet, and therefore exhibits for each location the "March" of temperature throughout the year. Fig. 52 shows at a glance the relative frequency of winds from different points of the compass, and also the relative prevalence of calms. Fig. 53 brings

into view the relation between the mean temperature of the air and its average daily variation (the mean maximum and mean minimum) ;

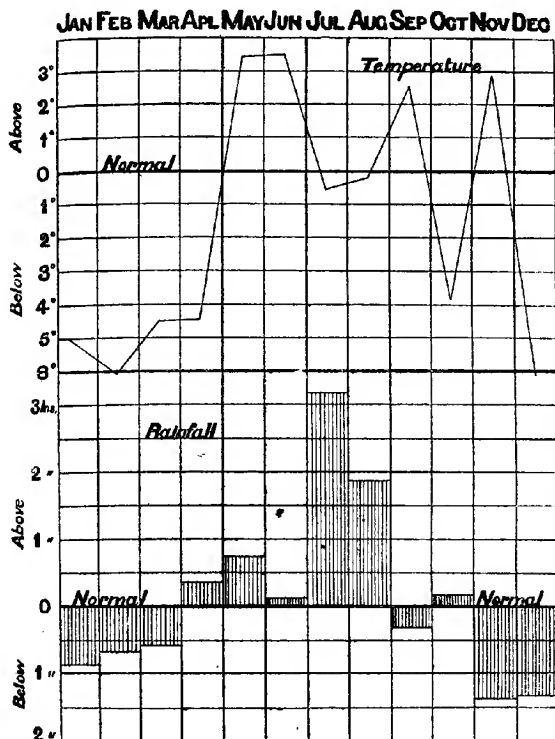


FIG. 50.—TEMPERATURE AND RAINFALL AT WISLEY, 1917, AS COMPARED WITH THE AVERAGE.

and also the mean temperature of the ground surface where it is covered with short grass.

The weather conditions for each month of the year may be summarized as follows :—

January.—The spell of cold weather, which had been so marked a feature of the closing months of 1916, was abruptly broken near the close of December, and the New Year began with a brief interlude of unusual mildness. This came about under the influence of a south-westerly wind which blew for a few days, and brought with it maximum temperatures of between 50° and 60° in several parts of the kingdom, the highest recorded at Wisley being 53°. But the improvement was very short-lived, and by the close of the first ten days Arctic conditions had again become general all over the British Isles. In

parts of Ireland, as well as over England and Scotland, the screened thermometer, four feet above the ground, showed from eight to ten degrees of frost; whilst unscreened thermometers laid in the open, close to the grass and fully exposed to the sky, gave much lower readings still: as, for example, at Wisley, where it recorded 25° of frost! It is obvious that the indications of this last-mentioned instrument are of special interest to gardeners, since it shows the degree of cold to which out-door vegetation has actually been exposed.

In the course of the month there were a few bright (but not *warm*) days, and, generally speaking, the amount of sunshine was largely

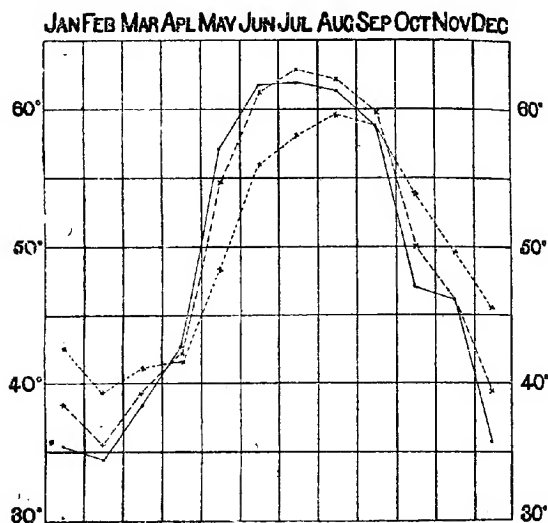


FIG. 51.—MEAN TEMPERATURE OF AIR (—), EARTH AT DEPTH OF 1 FOOT (---), AND EARTH AT DEPTH OF 4 FEET (...), FOR EACH MONTH OF 1917 AT WISLEY.

below the average; but notwithstanding this, and the generally unsettled character of the weather, there was less than the usual amount of rain or snow over the greater part of the kingdom. With such conditions as these, following as they did upon a long-continued spell of cold at the close of the preceding year, it was only what might have been expected, that vegetation generally should have been unusually late, and gardening operations everywhere, more or less, held up.

But in addition to this delay much real damage was done even to very hardy plants by the extreme cold, and perhaps still more by the biting, dry, easterly winds which accompanied it, and in a few districts also by the somewhat rare phenomenon known as *glazed frost*, when moisture falling as fine rain (sometimes almost imper-

ceptibly) upon the frozen ground becomes at once congealed, and covers everything with a coating of clear ice.

The results of the observations made daily at the Climatological Observatory in the Society's Gardens at Wisley are shown in the following table :

| | | | |
|--|-------|------------|----|
| Mean temperature of the air in shade | 35.1° | | |
| Highest " " " " | 53° | on the 1st | |
| Lowest " " " " | 20° | " 30th | |
| Lowest " on the grass " | 7° | " 30th | |
| Number of nights of ground frost | | | 20 |

| | | | | |
|--|-------|-------|-------|-------|
| | | 1 ft. | 2 ft. | 4 ft. |
| Mean temperature of the soil at 9 A.M. | 38.4° | 40.4° | 42.7° | |
| Highest " " " " | 45° | 44° | 44.5° | |
| Lowest " " " " | 33° | 37° | 40° | |

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 91 per cent.

Rain or snow fell on 13 days, to the total depth of 1.05 inches (equivalent to about 5 gallons of water to the square yard). Heaviest fall on any day 0.28 in., on the 5th.

The prevailing winds were at first westerly ; then from north-east and east.

The average velocity of the wind was 8 miles an hour.

There were 38 hours of bright sunshine, equal to 15 per cent. of the greatest possible amount.

There were 16 days on which no sunshine was recorded.

February.—The weather generally experienced over the United Kingdom during the greater part of this month was just a continuation of the Arctic conditions of January, but they were of even greater intensity and spread themselves over a rather larger area. Again it was dry, but at the same time very dull over the greater part of the kingdom, and during the first few days the cold was more intense than at any time in January, or indeed for many past winters. At Wisley the average temperature in the screen (four feet above the ground) was 34° Fahr., instead of 40°, which is the usual average for the month ; but on the ground the fully exposed thermometer once fell to 4° below zero (36° below the freezing-point), and on the warmest night of the month the temperature was no higher than 37° Fahr., conditions which are without parallel in the records hitherto obtained at the Gardens. The wind, too, was as keen and biting as in January, and was responsible for much damage to vegetation ; at Wisley "all vegetables suffered very much, many appearing as though they had been seared by fire ; whilst trees and shrubs were likewise much injured by the bitter winds" ; and a similar experience was fairly general over a large portion of the kingdom : *e.g.* in the West of Ireland, "hundreds of birds were killed by the intense cold and want of food ;" in the English Midlands, "evergreens, such as yew, laurel, holly, and ivy, were scorched by the frost" ; and in Devon, on the southern edge of the Dartmoor region, "the frost lasted continuously for 91 days, . . . and nearly all the furze was killed." To find a parallel for duration and intensity one must go back at least to 1895, but the Dartmoor record claims to have been the longest continuous frost for sixty-two years. At Wisley, up to the middle

four degrees below the average for March. But in addition to being cold the weather throughout was also everywhere dull and unsettled; and although in most districts the actual amounts of snow and rain recorded were somewhat below the average, yet the dampness of the air, combined with the extreme cold, made the weather exceedingly "raw" and unpleasant. Over the northern half of the kingdom, and also in the higher and more exposed portions of the English Midlands, the temperature fell occasionally to points in the neighbourhood of zero, and here and there temperatures *below* zero were recorded. Of course, with such weather conditions all garden and agricultural work was still further hindered, and by common

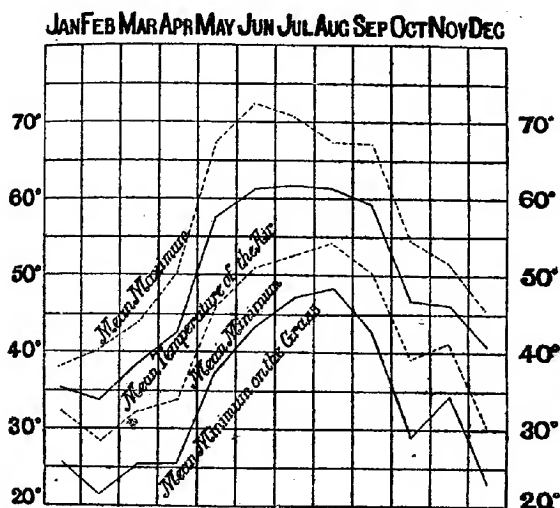


FIG. 53.—MEAN TEMPERATURE, MEAN MAXIMUM AND MEAN MINIMUM TEMPERATURES OF AIR AND MEAN MINIMUM TEMPERATURES ON GRASS FOR EACH MONTH OF 1917 AT WISLEY.

consent the season was reported as having been, all over the kingdom, the most backward experienced for a long series of years. At Wisley scarcely any Spring flowers were to be seen, a few Crocuses being the only things of the kind in bloom, and all gardening operations were much hindered. Ground frosts were registered in the Gardens on twenty-seven out of the thirty-one nights of the month, and on only two occasions did the thermometer rise, at any part of the day or night, so high as 50°. Bright sunshine was deficient everywhere, with the exception of one or two favoured districts, and in many districts the deficiency was large. It only remains to add that the month maintained its reputation for windiness, a feature which, combined with those already mentioned, helped to make it (in the

Isle of Wight, "lowest mean temperature during my 35 years' records"; Scotland, "coldest April during last 60 years," etc. But not only gardeners—farmers and flock-masters were also severe sufferers from the continued frost, and from heavy snow-drifts; and in more than one district, one of them being in the west of Ireland, these snow-drifts caused loss of human life also. The rainfall of the month was as a rule rather less than the average, but over the northern districts the average was somewhat exceeded.

The following table summarizes the results of the observations made at Wisley:

| | | |
|--|-------|-------------|
| Mean temperature of the air in shade | 42.4° | |
| Highest " " " " | 63° | on the 30th |
| Lowest " " " " | 27° | " 7th |
| Lowest " on the grass " | 13° | " 2nd |
| Number of nights of ground frost | | 27 |

| | | | | |
|--|-------|-------------|-------|-------|
| | 1 ft. | At depth of | 2 ft. | 4 ft. |
| Mean temperature of the soil at 9 A.M. | 42° | | 42.2° | 41.9° |
| Highest " " " " | 49° | | 47° | 44° |
| Lowest " " " " | 38° | | 39° | 41° |

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 78 per cent.

Rain fell on 15 days, to the total depth of 2.02 in. (equivalent to about 9.4 gallons of water to the square yard). Heaviest fall on any day 0.32 in., on the 2nd.

The prevailing winds were from between north-west and north-east.

The average velocity of the wind was 6 miles an hour.

There were 156 hours of bright sunshine, equal to 38 per cent. of the greatest possible amount.

There was but one day on which no sunshine was recorded.

May.—In marked contrast to what had occurred during the preceding months of the year the weather of May was unusually fine and warm; everywhere the temperature was higher than the average, the excess varying from about one degree at places on the coast to as much as six degrees over some inland districts, where the heating power of the sun made itself more manifest. As might have been expected from these conditions, a good many thunderstorms occurred in various parts of the kingdom, some of them being of unusual severity, accompanied by floods of rain, or by heavy falls of hail; but whilst in the western and southern districts the total rainfall was above the average, it was generally below it elsewhere. The amount of bright sunshine recorded was as a rule less than the average, the Eastern Counties of England being the most favoured, with about one-half of the possible amount; whilst Scotland had less than one-third, and the remainder, speaking generally, between one-third and one-half of the total possible amount; at Wisley the average daily duration was six and three-quarter hours. But taking a broad view of the climatological conditions, they were very favourable for gardening or farming operations; and although at the opening of the month everything was very backward, owing to the protracted winter, now, with the hot days, all growth leapt forward, so that by the close of the month the leeway had been more than made good, and the outlook

had become excellent. At Wisley it was reported that the "prospects for fruit were magnificent, notwithstanding that much of it had fallen with the hot weather"; and that "the caterpillar pest was bad both on fruit and forest trees. All vegetable, corn, and hay crops were splendid." Other reports spoke of "wonderful growing weather" in Yorkshire and elsewhere, whilst generally, all over the kingdom, the close of the month found "the face of the country presenting its normal aspect."

The following are the mean results obtained from the observations made at Wisley:

| | | |
|--|-------|-------------|
| Mean temperature of the air in shade | 57.2° | |
| Highest " " " " | 79° | on the 13th |
| Lowest " " " " | 35° | " 2nd |
| Lowest " " on the grass | 22° | " 9th |
| Number of nights of ground frost | | " 9 |

| | | | | | |
|--|-------|-------|-------------|-------|-------|
| | | 1 ft. | At depth of | 2 ft. | 4 ft. |
| Mean temperature of the soil at 9 A.M. | 53.9° | 52.1° | 48.6° | | |
| Highest " " " " | 60° | 58° | 53° | | |
| Lowest " " " " | 48° | 47° | 45° | | |

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 73 per cent.

Rain fell on 9 days, to the total depth of 2.20 in. (equivalent to about 10 gallons of water to the square yard). Heaviest fall on any day 0.73 in., on the 29th.

The prevailing winds were from between south-east and north-east.

The average velocity of the wind was 5 miles an hour.

There were 208 hours of bright sunshine, equal to 44 per cent. of the greatest possible amount.

There were but 2 days on which no sunshine was recorded.

June.—The weather during June exhibited some curious and apparently contradictory features. It was a bright and sunshiny month, and on the whole warmer than June: generally is, but the distribution of warmth throughout the month was quite unusual. During the first fortnight the daily maxima gradually increased until the days became excessively hot, and in many places the thermometer rose to nearly 90°, and in some parts of south-east England higher still. At Wisley the highest maximum reached was 89° on the 17th, but only a week later a ground frost occurred in the night, and did damage to potatoes and other tender things in some sheltered parts of the grounds, and the weather becoming still cooler as the month drew to a close, there was presently brought about a cold spell, in which the temperature fell considerably below its normal for the time of year—indeed, in the east of Scotland the minimum on the last day of the month was so low as 32°, whilst the mean temperature for the week was more than 6° below the normal. The rainfall was generally less than the average, but in some places it greatly exceeded it, owing to the occurrence of excessively heavy local rain-storms about the middle, and again near the close, of the month. In the first of these there was an unprecedented fall over western London, when amounts varying between two and a quarter and four and three-quarter inches were measured, the centre of the storm, and the

local of heaviest fall of rain, passing over Holland House, Kensington. The second storm occurred on the night of the 28th in Somerset, when there fell at Bruton 9·84 in. of rain, the largest daily fall hitherto recorded in Great Britain. It is perhaps unnecessary to point out that such storms as these quite upset the normal averages for the districts in which they occur. The weather conditions of the month, although at no time really settled, were on the whole favourable for the development of plant growth, and at Wisley everything made extraordinary progress, although, owing to the forcing character of the weather, the flowers were over very quickly.

The mean climatological results obtained at Wisley are given in the appended table :

| | | |
|--|-------|-------------|
| Mean temperature of the air in shade | 61·6° | |
| Highest " " " " | 89° | on the 17th |
| Lowest " " " " | 42° | " 23rd |
| Lowest " " on the grass | 32° | " 23rd |
| Number of nights of ground frost | | 1 |

| | | | |
|--|-------|-------|-------|
| | 1 ft. | 2 ft. | 4 ft. |
| Mean temperature of the soil at 9 A.M. | 61·3° | 59·5° | 55·7° |
| Highest " " " " | 65° | 62° | 57° |
| Lowest " " " " | 59° | 57° | 53° |

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 70 per cent.

Rain fell on 10 days, to the total depth of 2·28 in. (equivalent to about 10½ gallons of water to the square yard). Heaviest fall on any day 1·51 in., on the 28th.

The prevailing winds were from between south-west and north-west.

The average velocity of the wind was 4½ miles an hour.

There were 213 hours of bright sunshine, equal to 44 per cent. of the greatest possible amount.

There was but one day on which no sunshine was recorded.

July.—The weather conditions of this month were fairly normal, its chief outstanding features being a marked excess of bright sunshine, and a less notable excess of warmth. There were some occasional cool nights, and except over a few districts in the North, now and again slight ground frosts, but fortunately these were not sufficiently severe to do much damage to vegetation. In addition the month was unusually dry over the northern half of the kingdom, but less so in the south, and particularly the south-east, of England, where, owing to some heavy downpours during its closing days, the normal fall was largely exceeded. At Wisley, and over the Thames valley districts generally, the total for the month was between twice and three times the usual amount ; but the absence of rain during the earlier weeks had been the cause of much trouble in the Gardens, many plants, and more especially strawberries, suffering greatly from drought.

The mean results of the Wisley observations are given in the following table :

| | | |
|--|-------|-------------|
| Mean temperature of the air in shade | 61·8° | |
| Highest " " " " | 79° | on the 14th |
| Lowest " " " " | 45° | " 10th |
| Lowest " " on the grass | 35° | " 10th |
| Number of nights of ground frost | | nil |

| | | | | 1 ft. | At depth of 2 ft. | 4 ft. |
|--|--|--|--|-------|----------------------|-------|
| Mean temperature of the soil at 9 A.M. | | | | 62.8° | 61.5° | 58.2° |
| Highest " " " " " " | | | | 67° | 65° | 61° |
| Lowest " " " " " " | | | | 58° | 59° | 57° |

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 77 per cent.

Rain fell on 13 days, to the total depth of 4.75 in. (equivalent to about 22 gallons of water to the square yard). Heaviest fall on any day 1.75 in., on the 30th.

The prevailing winds were at first from north-east, then from south-west.

The average velocity of the wind was 4 miles an hour.

There were 215 hours of bright sunshine, equal to 44 per cent. of the greatest possible amount.

There were 4 days on which no sunshine was recorded.

August.—It is not unusual for the weather during August to exhibit some feature not generally associated with that of a mid-summer month, but fortunately it is not often that it combines at once so many peculiarities as it did in the month now under review. It may be summarized as disturbed and unsettled, very windy and dull; with a marked deficiency of sunshine and warmth; and, as regards the greater part of the kingdom, an excessive rainfall. The month opened with squally, rainy weather, and a continuance of the heavy rain-storms which had been so conspicuous a feature of the weather over the south-eastern counties since June. As a result, the total rainfall amounted in many districts to double, and in some to treble, the usual amount; and in parts of Surrey, Kent, and Essex, where the rain-storms were especially severe, there fell during the first week amounts which were from ten to twenty times greater than the normal. With such conditions there was, as might have been expected, but little bright sunshine; and as a further result the days were very cool; although, since the screen of cloud which cut off the direct rays of the sun by day served also to prevent the radiation of heat from the earth by night, these were followed by unusually warm nights, resulting in a higher *average* temperature than would otherwise have been the case. But these conditions were not altogether unfavourable to the horticulturist. The extremely heavy, but fortunately not very prolonged, "downpours" were not welcomed; but the abundance of moisture and the unusual warmth at night more than compensated for the loss of sunshine and heat by day, with the result that at Wisley, and in most other districts, extraordinary progress was made in plant-growth right through the month.

The observations made at Wisley are summarized in the following table:

| | | | | | |
|--|--|--|--|-------|------------|
| Mean temperature of the air in shade | | | | 61.1° | |
| Highest " " " " " " | | | | 76° | on the 7th |
| Lowest " " " " " " | | | | 48° | " 20th |
| Lowest " " " " " " on the grass | | | | 38° | " 20th |
| Number of nights of ground frost | | | | | nil |

| | | | | 1 ft. | At depth of 2 ft. | 4 ft. |
|--|--|--|--|-------|----------------------|-------|
| Mean temperature of the soil at 9 A.M. | | | | 62.2° | 61.8° | 59.2° |
| Highest " " " " " " | | | | 65° | 64° | 60° |
| Lowest " " " " " " | | | | 60° | 60° | 50° |

REPORT ON METEOROLOGICAL OBSERVATIONS, WISLEY, 1917. 327

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 81 per cent.

Rain fell on 22 days, to the total depth of 4.04 in. (equivalent to about 19 gallons of water to the square yard). Heaviest fall on any day 1.22 in., on the 1st.

The prevailing winds were at first north-westerly, then from south-west.

The average velocity of the wind was 7 miles an hour.

There were 171 hours of bright sunshine, equal to 38 per cent. of the greatest possible amount.

There was but one entirely sunless day.

September.—Like its immediate predecessor, this month was a very windy one, the prevailing direction of the wind being westerly, and its chief characteristic its gustiness rather than its exceptional strength, the force of a gale being seldom reached. But in contrast to the very wet August it was a dry month, the rainfall being as a rule much below the average, although in a few districts there were exceptions, owing to thunderstorms and heavy local rains, which, however, only affected very limited areas. But, like August, it was again a moderately warm month, and owing to a similar cause—the high average daily temperature being due to exceptionally warm nights rather than to very hot days. But in most districts the fresh, gusty, westerly wind proved to be very useful to the agriculturist, enabling him to dry his corn after the soaking the stooks had in the drenching downpours of August ; so that on the whole the weather of the month may be fairly summarized as having been seasonable, and good for harvest, and indeed all operations on the land. There was again rather less than the average amount of sunshine, but this was less noticeable at Wisley, and indeed over the whole of southern and south-eastern England, than in the northern parts of the kingdom ; and the generally favourable climatic conditions of the month, from the horticulturist's point of view, was evidenced by the quite unusual progress which continued to be made by all out-door plant life throughout.

The observations made at Wisley are summarized in the following table:

| | | |
|--|-------|-------------|
| Mean temperature of the air in shade | 58.6° | |
| Highest " " " | 75° | on the 11th |
| Lowest " " " | 41° | " 28th |
| Lowest " " " on the grass | 28° | " 28th |
| Number of nights of ground frost | | 2 |

| | | | At depth of | | |
|--|---|---|-------------|-------|-------|
| Mean temperature of the soil at 9 A.M. | | | 1 ft. | 2 ft. | 4 ft. |
| Highest | | | 59°8' | 59°8' | 58°6' |
| Lowest | " | " | 62° | 61° | 59° |
| | " | " | 56° | 58° | 58° |

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 84 per cent.

Rain fell on 12 days, to the total depth of 1.50 in. (equivalent to about 7 gallons of water to the square yard). Heaviest fall on any day 0.37 in., on the 17th.

The prevailing winds were south-westerly.

The average velocity of the wind was 5 miles an hour.

There were 57 hours of bright sunshine, equal to 46 per cent. of the greatest possible amount.

There were three days on which no sunshine was recorded.

October.—Taking a broad view of the weather of this month it may be summarized as windy and wet, with a mean temperature consider-

ably below the average; and therefore over the greater part of the kingdom it was by no means an ideal month for the horticulturist or the farmer. Everywhere it was very unsettled; the first few days were warm, and at Wisley on the 2nd the thermometer rose to 71° ; but then there ensued a long spell of cool westerly winds, sometimes blowing very strongly, and during their continuance the thermometer often failed to reach 50° in the warmest part of the day, and at night occasionally fell below the freezing-point in the screen, four feet above the ground, whilst the thermometer laid upon the ground recorded a frost nearly every night, the most severe being 18° below the freezing-point on the night of the 27-28th. The rainfall also everywhere exceeded the average amount, the excess being as a rule about 50 per cent., but in some districts very much more, and in the north and north-west more or less rain fell every day. This abnormal frequency necessarily interfered with gardening and agricultural work—early sowing of grain was prevented in some districts, and indeed in places in the far west a good deal of hay and corn still remained in the fields, awaiting a chance for the crops to dry sufficiently to be harvested. In other regions, however, there was a fair amount of sunshine as well as of rain. At Wisley more or less was recorded on thirty days, the average daily duration being four and a half hours; and over the eastern parts of England about an hour a day in excess of the usual amount was recorded pretty generally. The combination of unusual sunniness with an abnormally large rainfall, and exceptional cold, did not entirely check the vigorous growth of trees and shrubs, noticed at Wisley in the earlier months of the year, until this month had nearly closed; but the display of colour and tint in the foliage during the last fortnight was unusually fine.

The Wisley results are as follows:

| | | | |
|--------------------------------------|---------------|----------------|------------|
| Mean temperature of the air in shade | | 46.8° | |
| Highest " | " " | 71° | on the 2nd |
| Lowest " | " " | 25° | " 28th |
| Lowest " on the grass | | 14° | " 28th |
| Number of nights of ground frost | | . | " 21 |

| | | | | |
|--|---------------|----------------|----------------|--------------|
| | | 1 ft. | 2 ft. | 4 ft. |
| Mean temperature of the soil at 9 A.M. | | 50.1° | 52.2° | 53° |
| Highest " | " " | 57° | 57° | 57° |
| Lowest " | " " | 44° | 48° | 50° |

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 88 per cent.

Rain fell on 16 days, to the total depth of 3.29 in. (equivalent to about 15½ gallons of water to the square yard). Heaviest fall on any day 0.52 in., on the 12th.

The prevailing winds were westerly.

The average velocity of the wind was 6 miles an hour.

There were 137 hours of bright sunshine, equal to 42 per cent. of the greatest possible amount.

There was but one entirely sunless day.

November.—Throughout this month the weather over the greater part of the kingdom presented a sharp contrast to that of October, it being dry and sunless, but yet warm. At the same time in one other

respect it resembled that of the earlier month, it was very windy, and largely on that account it proved to be a capital month for work on the land, more especially after the first week, by which time the ground had dried sufficiently to allow all out-door operations to be easily carried on. From districts in the north and west, which are usually backward compared with those farther south, there came reports that all potatoes and roots had been harvested in good condition; and with them equally satisfactory reports of progress having been made generally with ploughing and winter sowing. At Wisley the open weather allowed all work in the Gardens to be satisfactorily and easily carried on, and the general conditions were described as "capital." The mean temperature was nearly everywhere above the normal, a result which was again due to the absence of cold nights rather than to very warm days; for the amount of bright sunshine recorded was generally less than the average, and the amount of cloud, and over some northern districts of rain also, was considerably above it; conditions which were mainly due to the continued persistence of winds from a westerly quarter.

The mean results from the Wisley observations are as follows:

| | | | | |
|--------------------------------------|-----------|-------|--------|------|
| Mean temperature of the air in shade | | 46.2° | | |
| Highest " " " " | | 60° | on the | 2nd |
| Lowest " " " " | | 29° | " | 26th |
| Lowest " on the grass | | 17° | " | 26th |
| Number of nights of ground frost | | | | 11 |

| | | | | |
|--|-----------|-------|-------------|-------|
| | | | At depth of | |
| | | 1 ft. | 2 ft. | 4 ft. |
| Mean temperature of the soil at 9 A.M. | | 46.8° | 48.0° | 49.5° |
| Highest " " " " | | 50° | 50° | 50° |
| Lowest " " " " | | 44° | 47° | 49° |

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 90 per cent.

Rain fell on 11 days, to the total depth of 0.87 in. (equivalent to about 4 gallons of water to the square yard). Heaviest fall on any day 0.30 in., on the 26th.

The prevailing winds were westerly, south-west to north-west.

The average velocity of the wind was 6 miles an hour.

There were 50 hours of bright sunshine, equal to 19 per cent. of the greatest possible amount.

There were 8 days on which no sunshine was recorded.

December.—The weather throughout the closing month of the year resembled very much that with which the year had opened, inasmuch as it was both cold and dry all over the kingdom. It was, however, seasonable weather, and little or no damage was done by the severe frost, since the fine weather of the preceding month had enabled farmers and others to secure their crops and place them under cover. A good proportion of the precipitation fell as snow, but the combined total of snow and rain was everywhere much below the average amount, and in many districts it was less than any December total had been for many years. But not only was the month a dry one, it was also unusually bright. The amount of bright sunshine recorded in December can, of course, never be other than relatively large; but this year there were days on which so many as six hours of continuous sunshine

were recorded at Wisley, and an hour more at a few favoured spots on the southern coast; and the average *daily* duration at Wisley for the whole month—taking dull days with bright—was rather more than one and a half hours, which is nearly 50 per cent. more than the average. This simply means that the sun's rays when focussed through a special lens had sufficient power to scorch a strip of card for a total of fifty-two hours, during the twenty-one days on which it shone at all; and although this may not appear to be a very large amount, it really is so for December, especially if it be compared with another December record obtained in 1890, also in Surrey (and not very far from Wisley), when the total amount for the entire month was only fifteen minutes! But notwithstanding the unusual abundance of sunshine this year, out-door plant life at Wisley was by no means vigorous: there were no signs at all of flowering on trees, such as Hamamelis; and only one or two flowers appeared on Hellebores; and, indeed, plant life in general was in a more backward state than had been observed in December for some years.

The following table summarizes the results of the climatological observations made at Wisley during the month:

| | | | |
|--|-----------------|-----------|-------------------|
| Mean temperature of the air in shade | | 35.3° | |
| Highest " | " " " | 53° | on the 1st |
| Lowest " | " " " | 16° | " 19th |
| Lowest " on the grass | | 6° | " 19th |
| Number of nights of ground frost | | | 19 |
| | | | At depth of |
| | | | 1 ft. 2 ft. 4 ft. |
| Mean temperature of the soil at 9 A.M. | | 39.4° | 42.5° 45.7° |
| Highest " | " " " | 48° | 48° 49° |
| Lowest " | " " " | 36° | 39° 42° |

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100), 89 per cent.

Rain fell on 10 days, to the total depth of 1.45 in. (equivalent to about 7 gallons of water to the square yard). Heaviest fall on any day 0.63 in., on the 16th.

The prevailing winds were south-westerly till the last week of the month, then north-easterly.

The average velocity of the wind was 5 miles an hour.

There were 52 hours of bright sunshine, equal to 22 per cent. of the greatest possible amount.

There were 10 days on which no sunshine was recorded.

NOTES FROM THE WEATHER DIARY OF AN OFFICER IN
THE B.E.F. 1915-1918.

By MAJOR C. L. WARD-JACKSON.

NOTHING could exceed the dreariness of the winter 1915-16. I was attached to the Headquarters Staff of a Corps which had taken over in the previous July from the French a portion of the Front Line opposite the villages of Gommecourt and Serre of gory memory.

Until the arrival of the British this part of the front had been almost peaceful. Peasants worked on their fields within easy range of hostile field artillery, and even of machine-guns. It was possible in places to ride on horseback within view of the enemy's front trenches and spy them through a glass without evoking the stuttering protest of an angry Maxim concealed in its emplacement of German concrete. Indeed a French villager related to me how a truce was always declared at the hour of *déjeuner* between a French battalion on one side of No-Man's-Land and a German battalion on the other, and each party on fine days scrambled out of its trench into the open and partook, unmolested, of the midday meal in full view of the enemy. Despatch-riders rode their machines backwards and forwards to Battalion Headquarters with little more fear of gun trouble than at home, while aeroplanes were almost always, except for their curiosity, politely behaved.

Things livened up considerably after the arrival of the British, full of pride now in an increased supply of gun-ammunition and very wrathful against the Huns, whose unwelcome attentions they had had strenuously and patiently to bear for many months further north. Yet even now Staff Officers in their motor-cars could daily be seen entering Hébuterne, which was almost in the Front Line System, while the artillery on either side chiefly fired when the respective C.R.As wanted to let the other fellows know that they were awake and entitled to some respect, and when the British wanted to show, by Jingo! that they had actually two rounds per gun to spare.

As winter approached, down came the rain and with it increased activity and discomfort, together with a far greater tension between the opposing armies. And certainly the weather was not conducive to Christian charity. There was scarcely any snow and but little more frost the whole winter until the end of February, when we had severe frost and blizzards, in one of which the Huns attacked at Verdun. It rained and rained instead. During December rain fell on twenty-four days, and a wet, mild, and blustery Christmas Eve culminated in a heavy thunderstorm in the afternoon.

March and April of 1916 were bitterly cold; May and June were

very little better, but July 1, 2, and 3, the first three days of the Battle of the Somme, were fine and warm, even if the wind were, as it ever is, in the wrong quarter for our gas. These were immediately followed by the disastrous four wet days which effectually precluded our taking full advantage of the great successes we had gained in the southern part of the battlefield. The weather afterwards improved, but it remained cold, and the end of August brought day after day of rain and chilly north-west wind and the consequent breakdown of the Somme roads. The clerk of the weather has indeed been no friend of the Allies in this War. He has on the contrary showered unending and incalculable blessings on our enemies.

September was very cold, and I only note six days in the month with wind from south or west: on all the others there was wind from north-west or east, a most unusual condition for the month. October and November were normal, but there were six consecutive days of extraordinarily dense fog from November 28 to December 3. December was again a month of rain and floods with mild temperature.

Wintry weather set in on January 14, and on January 20 began the wonderful frost of 1917. From that date until February 15 the most rigorous severity prevailed, and the daily minimum temperature from January 22 till February 11 actually averaged $11^{\circ}24'$ Fahrenheit, or $20^{\circ}76'$ of frost per diem! The hardest frosts were on January 28 and February 9, 29° and 27° respectively. There was a recrudescence of this long winter during March, the thermometer registering frost on sixteen days, but it was less severe.

The early spring of 1917 was exceedingly tempestuous, and the Battle of Arras commenced amid driving snow-storms, very trying to the fighting troops. I saw the first swallow on April 23 and heard the first cuckoo on May 1.

The summer of that year was as remarkable in its way as the previous winter had been. Between May 21 and June 20 the maximum shade temperature fell below 70° on only three days, the highest reading being 84° on June 18; while from June 20 till October 4 it never upon one single day fell below 60° . During this period of 106 days the thermometer showed 80° , or over, only twice; but it exceeded 70° on forty-four days. Only on fourteen days did it not reach 65° . As to the minimum daily temperature, the mercury never fell below 50° from June 4 till September 20.

Thus the summer of 1917 was exceptionally equable. Moreover, it was fine and sunny without being droughty, and it would be hard to find a more lovely month than September of that year.

The remainder of the autumn was uneventful from the weather point of view, and our opinions were much divided as to the winter's prospects. Most of us thought we would be let off easily after the rigorous experiences of the previous winter. We were wrong. The arctic spell began at an earlier date: that was the only difference. It froze on December 10, and from that day till January 9 winter held us in a grip of iron. We had 21° of frost on December 23 and 26° on

January 8, 1918, and the mercury stood at 22° Fahrenheit, or less, on twenty-one occasions during this period.

In February I left France and thus missed (with but faint regrets!) the pernicious and deadly fog in the morning of March 21, which was the most wonderful stroke of luck for the Huns in their great attack that the most diabolical imagination could devise.

Surely, now that it has done its worst for our side, we may hope for a change in Fortune's wheel as regards the atmospheric conditions. None but sailors at sea and soldiers at the front can realize how potent a factor in this War is the weather.

PRESERVATION OF CROPS FROM INJURY BY FROST.

By ALEXANDER McADIE,

Professor of Meteorology at Harvard University, formerly in charge
of the Weather Service of the United States for California.

THROUGHOUT Christendom at the present moment the uppermost topic of discussion is food. The outcome of the war for Liberty, as we believe it to be, will depend largely upon the supply of food. In the countries of the Allies as well as in Central Europe every effort is being made to increase the crop yields. This is done by increasing the acreage and by intensive cultivation. Fertilizers are used as never before, and where formerly a few tons of manure were regarded as sufficient for an acre of ground, to-day in places one hundred tons are employed. Farming operations are carried on during the night as well as the day, labourers go to their work in shifts so that no time may be lost, tractors do the work of many horses, and in every direction there is striving for a maximum yield. Those of us who are not farming or gardening do our bit by lessening the demand, practising economy, and preventing waste. In this last-named effort, namely, the prevention of waste, it would seem wise at this time to study natural wastage, for Nature itself is the master spendthrift; and the loss by natural conditions, such as pests, drought, and frost, may easily exceed the savings of the community for a long period. Now is the time, if ever, when united and properly directed effort should be made to reduce the loss occurring through frost. In this paper we shall not stop to consider spring frosts and the losses due to tender vegetation, reserving this discussion for a later paper, but shall consider only the *autumnal* frosts, when vegetation is advanced and nearly ready for the harvest; and when loss therefore is doubly disastrous.

We shall consider the theory and practice of frost-fighting, first from the aerographer's standpoint, and later from the grower's point of view.

I.

Frost, in the general acceptance of the term, means a temperature of freezing or below, and of sufficient duration to result in damage to the cell tissues of plants near the ground. The loss of heat from both ground and plant is chiefly caused by radiation. The control is the flow of air plus water vapour near the ground. In other words, frost is to be regarded as a problem in *local air drainage*. The duty of the forecaster is to detect and give warning when conditions favour local stagnation and intense radiation. Can this be done successfully? Yes. For these conditions may be expected when an area of low pressure or surface depression moving rapidly eastward is followed by

an equally rapid in-moving high. There results boisterous west to north winds, subsiding as night approaches. Then comes a period of stillness and there is no mixing or churning of the air. With the cessation of convectional currents there is also diminishing amount of vapour and haze or dust. The first law of frost-forecasting is that conditions must favour the surface inversion of temperature characteristic of still, clear nights with dust-free atmosphere and low humidity.

Air can flow in any direction, and the forecaster will follow closely the great displacements in horizontal directions; but in dealing with frosts of the late autumn and early winter he must be keenly alive to the action of slow, vertical currents, chiefly descensional. These slow-moving surface currents, which might be called *creeping* currents, complete the fall in temperature which the larger horizontal movement began. Marked inversions take place after the cyclonic winds have calmed down. Then begins what might be called local air drainage, and the formation of ponds of stagnant dry cold air. On windy nights there is little likelihood of frost, and the temperature is as a rule higher, because there is thorough mixing. It should not, however, be forgotten that wind favours evaporation, and, unless from a water surface, tends to dry and cool vegetation. Again, temperature is largely controlled by humidity, and if there is much moisture present the amplitude or range will be small. More important still, the rate of cooling will be a minimum. Therefore, when high humidities are reported the probabilities are that there will be no frost. On nights when frost is anticipated, data showing temperature gradients in a vertical direction will help the forecaster. If special readings can be made of two similar thermometers not in shelters, one 100 millimètres above the soil and the other a mètre higher, these will help. On frosty nights the minimum temperature is found to occur not on the soil itself, but about 10 millimètres above. With regard to data from wet-bulb thermometers there is some uncertainty, because unless a sufficiently low dew-point be obtained the readings may mislead. The trouble is that, as generally obtained, the wet-bulb reading is not low enough, because proper provision has not been made for determining the amount of air passing over the wet bulb in a given time. While sling psychrometers and whirled psychrometers improve matters somewhat, still there is no way of knowing definitely how much air has passed over the wet bulb. It is assumed that the distance travelled by the wet bulb is practically equivalent to an air flow of three or four metres per second, and that this is adequate ventilation. But, of course, there should be a definite time and a definite radius of rotation, or else each observer will report a depression of the wet bulb, depending upon his own idea of what constitutes a sufficient ventilation. With the whirled psychrometer it is possible at small expense to improve matters by adding a small toothed disk and a cheap spring bell. Thus an instrument which the writer uses sounds the bell for every 100 revolutions, and with watch in hand the speed can be easily regulated to 100 revolutions a minute. To get the true depression the whirling

should be continued fully five minutes. It is necessary to emphasize this point, because one reason why the dew-point fails to indicate the minimum temperature of the coming night is faulty manipulation.

The theory that the succeeding minimum will not be below the dew-point presupposes that both general and local conditions will remain constant, and while in general at times of frost conditions do remain unchanged, there are exceptions. If the humidity is high when the observation is taken near sunset, the chances are that the dew-point will be two or more degrees centigrade above the night minimum. If, however, the station is in the lowlands and the instruments not far above the soil, the readings will not fairly represent the temperatures of the lower air mass. It would be better to get the dew-point at higher levels.

The forecaster should have before him a rather detailed topographical map with contours for every ten mètres. He must appreciate the trend of valleys and differentiate between valleys more or less walled in and those which are open, particularly those open to the sea. The inclination of ridges to the prevailing winds is of some importance. A comparatively slow flow of air will prevent frost unless the air in its passage over higher land has been dynamically dried. Such air in its descent may gain in heat, but not enough to offset the cooling due to contact with the soil cooling rapidly by radiation. The forecaster, then, carries a mental picture of basins filling with dry cold air from rather shallow streams. These ponds are only a few mètres in depth, and are capped by a layer of much warmer air widely spread. And this is what we mean by *inversions*; the cold air is down and cannot get up; the warm air is up and cannot get down, and there is marked stratification within a few mètres from the ground.

Besides the topographical map the forecaster must know something of the nature of the soil, for this is important in determining what may be called the effective radiation. Dark soils and certain covers* will radiate more rapidly, and hence show lower temperatures. The general forecaster can hardly be expected to be an expert for all localities, hence it is a good plan to have in selected districts a local forecaster, preferably an agriculturist who knows something of soils, and also the relative susceptibility of different plants to frosts. He will know where the land has been ploughed and where it has been left unbroken. the crop cover, the presence of wind-breaks, and the minor slopes.

For crops on hillsides the factor of safety is large. Protection comes from both mixing the air and the warmth derived from the great reservoir of warm air which we have described as lying above the cool air. During the night hours the air moves toward the hillsides, and whatever convectional changes take place, the resultant

* The *streakiness* of frost even on a nearly level field may be due, first, to differences in thermal capacity of soil and cover, and second, to the minor circulations thus established. For example, over a dark soil the cold air will settle, forcing warmer air elsewhere. And as even a slow flow will prevent frost, we find frost-free areas not far from frosted areas.

circulation is the slow drift of overspreading warm air toward the slope.

The forecaster's great aids are cloudiness and wind. If the observations show conditions favouring cloud-building, which means strong convectional currents, there is little danger of frost. The cloud cover is Nature's own way of preventing frost. Even a fine veil of upper cloud will suffice.

In the main, frosts occur when an anti-cyclone stagnates, if we may so express it. The circulation at the surface is certainly sluggish for a period of forty-eight or seventy-two hours. This is why frosts recur, with the minimum temperature getting lower on successive nights. The rapid dying out of convectional currents before sunset, a low percentage of saturation, and a tendency of the dew-point to go lower are all favourable for frost.

II.

The problem of protection, from the agriculturist's point of view, will now be considered, it being assumed that forecasts of frost have been received. Forewarned is forearmed! But not in this case, unless the grower has prepared a supply of fuel, covering material, water and sand, or fine ash, preferably wood-ash. It will not do to wait until frost comes.

First, how shall we prevent cooling near the ground? The easiest way is to conserve the earth's heat by covering the plants with cloth, paper, straw, or by a suspended cover of dense smoke, generally called a smudge, and most easily produced by sprinkling water on small fires made of brushwood. This causes a thick heavy smoke, and all things considered is the cheapest and most effective protection against frost.

Another method is to apply heat directly in the shape of open small fires or fuel in fire-baskets, or by the so-called orchard heaters, which are essentially metal containers holding less than a gallon of oil and arranged for slow burning. Large open fires are not effective, because they warm the higher levels where the heat is not needed. Indeed, the problem really consists in displacing or heating a comparatively shallow stratum of air close to the ground. There is therefore no gain in burning bonfires unless in some way a circulation can be established and the warmer upper air brought down. Unfortunately in most instances this is not the case, and the surface cold air is simply replaced by other cold air. The slight gain due to mixing and motion is incommensurate with the fuel used.

Another method would be to mix the air, establishing a circulation by blowers or windmills; and still another method would be the use of substances with high specific heat, which had previously been heated. Such agencies would be water, sand, and wood-ash.

The first method, that of covering, was practised on a small scale by our grandmothers, who covered at sundown their favourite rose-bush

and nearly always saved it from frost. The theory is simply this, that any cover intercepts the re-emitted heat waves going from the ground to space. These are not exactly the same heat waves which were received during the day, being much longer, having approximately wave-lengths of 0.012 millimetre. These longer waves are more easily trapped or intercepted. Any medium—cloth, paper, smoke, or floating ashes—that interferes with free radiation stops the outflow and loss of energy in the form of heat waves and is in this sense a protective frost cover.

The best type of cover is a cloud; and clouds, whether high or low, are good frost protectors. When we can make artificial clouds we can eliminate frost.

It is an advantage to cover *early*; indeed, an hour or two *before*, rather than after sunset. Newspapers, cloth screens, fibre screens can be used. If soft material is employed, especially paper, there may be wetting, and so in the long run it will be found cheaper to employ weather-proof material. It is also important that the material used be properly fastened and kept in place.

The method of direct heating has met with much success in the orange groves of California and elsewhere. Modern heating methods date from experiments begun by the writer in that State in 1895. The fuel originally used was coal; later wood, straw, and brush were used, now however supplanted by crude oil or distillate. With modern orchard heaters, about thirty to the acre, the temperature can be maintained 3° C. above freezing, thus preventing refrigeration of plant tissues.

The method of utilizing the heat of higher levels by ventilation has not been commercially developed. The method of applying water either in spraying or by running ditches or flooding has proven entirely successful. The method of sanding, cleaning, and draining over bog-lands is effective.

One other important consideration remains, and that is injury of plant tissues due to rapid rise in temperature *after* the frost. Defrosting if too quick may result in damage where no damage was effected by the low temperature. In this connexion water may be used to advantage, for both water and water vapour have high specific heat as compared with air; roughly, water has four times the capacity for heat that air has. It is essential that the restoration of plant juices and tissues to their normal state be accomplished gradually, neither too rapidly nor yet too slowly. There is probably an optimum temperature for thawing or defrosting frozen fruits and vegetables. Finally, temperature records need careful interpretation. The freezing-point of liquids under pressure in the plant cells or exposed at the stomata may be different from free air values. Air gains and loses heat chiefly by convection or translation. Losses by conduction are small. Plants gain or lose heat by radiation, convection, and conduction of an internal character. Soil gains and loses heat by radiation and conduction. The loss of heat in the air stratum near the ground

is due first to convection and horizontal translation of the air, then by contact with the soil cooling rapidly by free radiation.

Frosts are recurrent phenomena, and may reasonably be expected within certain dates. The cumulative losses are considerable. To be serviceable the protection must be available for several nights in succession, for there is no profit in saving a crop one night and losing it on the following night. The effort to protect is worth while.

TREES AND SHRUBS FOR AUTUMN AND WINTER EFFECT.

By C. R. FIELDER, V.M.H.

[Read September 11, 1917; Mr. E. A. BOWLES, M.A., V.M.H., in the Chair.]

THE planting of trees and shrubs for the sake of the autumn tints of their foliage, their brightly coloured berries, or the colour of their bark in the winter, appears until comparatively modern times to have been chiefly confined to the Holly, the Mountain Ash, and perhaps the silver-barked Birch.

Of course, we have always had the Elm—a cloudy mass of gold in the autumn, almost if not quite unsurpassed by any other tree—the slightly less conspicuous yellows of the Hornbeam and the English Maple, and the rich browns of the Oak and the Beech. But the Oak, Elm, and Beech, when planted in the pleasure-grounds or park, were probably introduced on account of their beauty as timber rather than for the autumn colouring of their leaves.

A new era may be said to have begun upon the introduction of the Virginian Creeper in 1629, followed at various intervals down to the present time by the American Scarlet Oaks, and Maples from different parts of the world, those from Asia including the brilliant-foliaged Japanese Maple, *Acer palmatum*, and its varieties, with their curiously divided leaves.

Many other trees and shrubs having coloured autumn leaves and fruits of varying degrees of brightness have been and are still being introduced, notably many Berberis, Cotoneasters, Vitis, and Viburnums from China, so that for some years there has been no lack of good material for the brightening of the garden in the autumn and winter; but nothing like full use has yet been made of the many trees and shrubs that are available for that purpose.

Although some of the trees I have mentioned have long been in this country, their distribution appears to have been slow. The great advance that has taken place in horticulture during the past thirty years or so has, however, afforded opportunities for their freer use. These opportunities have been embraced by many, while other gardens may still be seen where the planting of shrubs for autumn colour has been almost entirely confined to the Sumach and the Ampelopsis.

The splendid exhibits of autumn foliage shown in the Hall for some years past have afforded ample proof of the wealth of material that gardeners now have at their disposal.

The best effects are obtained when the trees or shrubs are planted in groups, which may vary in size according to the extent of the garden,

and should be situated where the sun has full access. This is essential if the full beauty of the autumn colouring is to be secured, but its importance is too often overlooked. It is the summer sunshine that produces the bright-coloured bark, and the fruit on berry-bearing shrubs; and it is the gleam of autumn and winter sun which lights up and intensifies the colouring of leaf, bark, and berry.

The point of view should also be taken into consideration when planting. With very few exceptions the trees should be so planted that they may be seen with the sun behind the observer. The full effect of autumn foliage, and berries and bark in winter, depends almost entirely upon this. Almost the only exceptions to this rule that I have noticed are the Claret Vine and *Acer Schwedleri*, whose semi-transparent red leaves are equally beautiful whether viewed with the back or the face to the sun.

Trees and shrubs for autumn and winter effects should be planted in prominent positions. Too often, through mistakes when planting, or neglect of subsequent thinning, much of the effect is lost, just sufficient remaining to show what beauty there might have been had the trees been given sufficient room to develop.

In thinking of the taller-growing trees that are suitable for our purpose, one of the first to come to mind is the American Scarlet Oak, *Quercus coccinea*. Trees of this raised from seedlings vary somewhat in the colouring of the leaves, but, all things considered, it is one of the most satisfactory trees to plant. It grows quickly, for an Oak, and requires plenty of room, and therefore it is even more suitable for the park than the pleasure-ground. It is always pretty, and frequently gorgeous in its autumn colouring. There is a very bright-coloured form which is propagated by grafting, the leaves of which remain on the tree much later than those of seedling scarlet Oaks.

Quercus rubra is another fine Oak with large leaves, which are of a darker red than those of the Scarlet Oak.

Some of the larger-growing Maples are almost as brilliant as the Scarlet Oak. The Norway Maple, *Acer platanoides*, makes a fine tree, and its large leaves turn a rich golden colour in the autumn. One of its varieties is *Schwedleri*, with large purplish leaves, which change in the autumn to a bronzy-red colour. This is a fine quick-growing tree. Another equally good variety is *Reitenbachii*. *A. saccharinum*, the Sugar Maple, is another of the taller Maples with bright autumn leaves. *A. pictum* and *A. pictum aureum* have rich yellow leaves, and *pictum rubrum* red leaves in the autumn. They are much smaller-growing trees than those previously named, and so also is *A. tataricum Ginnala*, which has a very graceful habit of growth, and foliage which becomes beautifully tinted. The still smaller and more brilliant Japanese Maples will be dealt with when we come to the lower-growing shrubs.

The Tulip Tree, *Liriodendron tulipifera*, in addition to producing its fragrant, tulip-shaped, orange, yellow, and green blossoms in the

summer, makes another grand display in the autumn, when the foliage changes to a rich yellow colour.

Liquidambar styraciflua is a beautiful tree with leaves resembling those of some of the Maples. The colour changes in the autumn to a bright red. This tree likes a moist loamy soil. The brightest-coloured specimen I have seen was growing by the side of a lake, about 3 feet above the water level.

Among the Coniferæ there are several trees that are valuable for their winter colouring. Where there is room for *Cedrus atlantica glauca* few will deny themselves the pleasure of possessing this beautiful silvery-leaved tree. It is, of course, silvery in the summer as well as in the winter, and so also is that most beautiful of all spruce firs, *Picea pungens glauca*, which is commonly known as the Blue Spruce.

The foliage and shoots of *Cryptomeria elegans* are dark green until the approach of winter, when they change to a bronzy-red, which is very attractive, and forms a fine contrast to conifers with silvery or golden foliage. *Cupressus Lawsoniana lutea* retains its yellow colour throughout the winter, and the foliage of *C. Lawsoniana Allumi* is of a bluish tint. There are many others, but these are a few of the most distinct.

In the generality of gardens there is more room for shrubs than for taller-growing trees; therefore it is fortunate that among the lower-growing species there is a wide choice of beautiful subjects for providing autumn and winter colour, either by means of leaf, berry, or bark.

We will first make a selection from those having coloured leaves. The Japanese Maples are pre-eminent for the brilliancy of their autumn colouring, and in the case of many varieties the young foliage is equally attractive in the spring. This makes these Maples doubly valuable. The young shoots are rather liable to be injured by late spring frosts, and for that reason it is wise to plant in a position where the early morning sun cannot shine on the trees while they are frozen. These Maples are varieties of *Acer palmatum*, and probably the most brilliantly coloured variety is *atropurpureum*, though nearly all are more or less attractive. The leaves of some of the varieties are very curiously mottled. Japanese Maples are slow-growing, and should not be planted where they are likely to be overgrown by stronger-growing shrubs. They love a deep loamy soil.

In soils that are free from lime, the deciduous Azaleas (or Rhododendrons as they are now named) of the Ghent and Ponticum groups, should be freely planted. These have flowers of many delightful shades, which are followed in the autumn by leaf tints that are equally charming. They are very suitable for the pleasure-ground, and may also be planted in the more open parts of the wood.

Amelanchier canadensis is another shrub which provides a rich autumn display, and is also one of our prettiest spring-flowering shrubs. Its popular name, the 'Snowy Mespilus,' well indicates the appearance of a good specimen in full bloom. It is sometimes grafted on the

whitethorn, therefore suckers must be watched for, and promptly removed when seen.

Very striking is the autumn colouring of *Parrotia persica*. Some of the leaves may be crimson, some yellow, and others pale yellow, margined with light crimson. This shrub grows freely, and is not fastidious in the matter of soil. The foliage is retained longer than that of most deciduous shrubs.

The *Rhus* family, better known as the Sumachs, is a brilliant one, but it contains a black sheep which, possibly on account of its bad character, sometimes goes under the respectable name of *Ampelopsis Hoggii*. Its real name is *Rhus Toxicodendron*, a climber with leaves resembling the Virginian Creeper, and they assume a very brilliant colour in the autumn. It is, however, very unwise to plant it, as persons handling it are liable to suffer from very serious skin eruptions. The other well-known Sumachs are thoroughly desirable shrubs, of most gorgeous autumn colouring. These include *Rhus typhina*, *R. glabra* and its variety *laciniata*, *R. Osbeckii*, and the dwarfier species, *R. copallina*.

Pyrus arbutifolia is a shrub with flowers resembling May-blossom, which are succeeded by dark-red berries. The shiny dark-green leaves turn a brilliant red colour. The foliage of some of the *Berberis* family colour well, the most beautiful species being *B. Thunbergii*.

Euonymus alatus is one of the Spindlewood family, and the beauty of its autumn leaves is hard to beat.

Other good shrubs are *Cornus Kousa*, *C. florida*, *C. Nuttalli*, and *Ribes americanum*.

There are many trees and shrubs with more or less brightly coloured bark, and the eye dwells on these with pleasure when the last of the leaves have fallen, and the birds have eaten the berries. *Salix ramulis aureis* is a very quick-growing willow, of graceful drooping habit, with very long whip-like shoots, and pale-yellow bark, which, when lit up by the sun, is very beautiful throughout the winter. *Britzensis* is a good willow with red bark.

The Dogwood family gives us *Cornus sibirica*, *C. sanguinea*, and *C. stolonifera* with red shoots, and the variety *flaviramea* with yellow shoots.

Acer pennsylvanicum, the snake-barked Maple, has smooth green bark on the stem and branches, which splits open lengthwise, showing clear white stripes. The young shoots are bright red. It is altogether a very pretty tree.

Very few people will overlook the Silver Birch, whose stems are almost as conspicuous under the moon as in the daylight.

The red hairy stems of *Rubus phœnicolasius*, also known as the Wine Berry, which ripens its pretty fruits in August, the equally red stems of *Rosa nitida* and *lucida*, both of which have bright-red autumn leaves, *R. rubrifolia*, with its plum-coloured bark showing through a thin white bloom, all help to brighten the garden in the winter season. So also do the whitewashed brambles, *Rubus*

leucodermis, *R. biflorus*, and other newer species, although these are more at home in the wild garden, where they may have room for full development, when the tall white stems are very effective.

The young shoots of *Berberis virescens* are brightly coloured, and the berries are a darker red than the common Barberry.

The bark of *Arbutus Andrachne* and *Taxodium sempervirens* is of a ruddy-brown colour, which becomes more conspicuous as the trees increase in age.

In the case of deciduous shrubs with bright-coloured bark, the effect depends largely upon the quantity and length of the young shoots. It is therefore frequently the custom to cut such shrubs as *Cornus sibirica* and *C. sanguinea*, and the red-barked willows, back closely at the end of the winter, which causes them to throw up strong shoots which colour very brightly.

There are numerous climbers with brightly coloured leaves, and their number is continually being added to. When *Ampelopsis hederacea*, the Virginian Creeper, was first introduced, it must have caused a sensation in the garden, and this old climber is still one of the best. Unlike *Ampelopsis Veitchii*, which clings like ivy, the Virginian Creeper requires assistance in reaching the eaves of the house or the branches of an old tree, but after that it may be left to drape the gable with its long red streamers each autumn, and arrange festoons among the branches of the tree.

Ampelopsis Veitchii, since its introduction from Japan in 1868, has largely superseded the Virginian Creeper as a wall plant. This is due to the rapidity with which it climbs without help, and to the greater brilliancy of its autumn colouring. If it has a fault it is its almost too trim and tidy appearance. *A. muralis* and *Engelmannii* are other good varieties of *Ampelopsis*.

The following species of *Vitis* are suitable for the verandah, pergola, arch, and wall, or for clothing tree stems. *Henryi* has white bands along the midrib and lateral veins of the leaves, and the young shoots and the backs of the leaves are of a purplish colour, while the autumn colouring is good and distinct. I have quite recently seen plants growing in shady positions, whose appearance seems to show that both the summer and autumn colouring may be even better under those conditions than in the full sunlight. *Vitis Coignetiae* and *Thunbergii* are two strong-growing, large-leaved vines, and both are very valuable plants for the pergola. Their autumn colouring varies, but is usually very brilliant. *Vitis armata* is one of the more recent introductions, and is a very beautiful species. *Vitis purpurea*, the Claret Vine, has dark-red leaves throughout the summer which become much brighter in the autumn. When seen with the sunlight shining through the leaves the effect is very striking.

Then, lastly, we have the shrubs with bright-coloured berries. No one is likely to overlook the Hollies, because they are always with us, and will always remain indispensable. So also will the Mountain Ash and the Pyracantha, even though the fondness of the birds for

their berries so sadly shortens their period of beauty. Birds do not appear to interfere so much with the orange-coloured berries of the newer *Pyracantha angustifolia*. Both this species and *Pyracantha Lalandei* may be planted against a wall, or grown as bushes, at least in the southern half of the country. Our native Hawthorn is beautiful in May and again in the early winter when its shoots are crowded with berries. The much larger-berried American thorns, *Crataegus coccinea*, and *C. Crus-galli*, the Cockspur Thorn, are very ornamental, and in recent years Professor Sargent has brought into notice many other fine thorns.

The Berberis family is rich in bright-berried plants, some of them old favourites, others new-comers, which, on account of their undoubted beauty, have come to stay. *Berberis Wilsonae* is one of the very best of them, its branches often being weighed down by masses of beautiful coral-red berries.

Our fine native shrubs, *Viburnum Lantana*, *V. Opulus*, and *Euonymus europaeus*, with their bright berries, attract our attention in the hedgerows and woods, and are worthy of a place in all gardens where room can be found for them. They are good wild garden shrubs. *Viburnum rhytidophyllum*, and *V. Henryi* are evergreen shrubs recently introduced from China. They have bright scarlet berries, and are great acquisitions. The orange-coloured berries of the Sea Buckthorn remain in beauty till midwinter.

The bright-coloured hips of the briars and roses also perform their part in adding colour to the garden in the winter, notably the fruits of the Penzance Sweet Briars, *Rosa rugosa*, and *R. Moyesii*. And, finally, we have those beautiful crab fruits, hybrids of the Siberian crab, which should find a place in all gardens, large or small.

Many other trees and shrubs that I have not mentioned are available for autumn and winter colour effects, especially among those recently introduced from China, but if the interest and attention of the owners of gardens should be directed towards the more free use of plants of this description for the embellishment of their gardens, the object of this lecture will have been achieved.

SOME HINTS ON THE MANURING OF GARDEN CROPS.

By H. E. P. HODSOLL, F.C.S., M.S.E.A.C.

[Read August 28, 1917; Mr. E. H. JENKINS in the Chair.]

OWING to the submarine menace the question of food production in this country has become one of which an entirely different view must now be taken. In the past, farming and the growth of food-stuffs generally have been left entirely to private enterprise and have received little, if indeed any, national attention. Successive Governments have consistently and persistently ignored the fact that the industry of producing food—and consequently wealth—from the soil, must of necessity be of the first national importance.

It has taken the grim spectre of starvation to wake us up to this fact, and in view not only of the national shortage of food-stuffs, but of the world shortage, which is likely to continue for some years, we are now faced with the urgent necessity of producing the maximum crops from our farms and gardens.

Every owner or occupier of a garden or an allotment is, or ought by this time to be, aware of this fact; he knows that the prices of all foods have risen enormously since those far-off days before the war, and he shrewdly suspects that it will be a long time before supplies and prices return to their pre-war level, if indeed they ever do so.

The point therefore that we have to consider is—Can this increased production be brought about, and if so by what means? Every student of horticulture knows that it can. We have only to visit a highly cultivated garden, or one of the districts where the best intensive cultivation is practised, to be astounded at the amount of food and wealth that an acre of old England can produce. What, then, is the secret? Wherein lies the difference between these fertile areas and so much of the country which we see yielding poor crops of inferior quality?

The reply frequently given, that it is all a question of soil, is not true. Admittedly the man who has a good natural soil starts with an advantage; but most of the soil in this country is capable of producing good and profitable crops if only it were properly drained, cultivated, and manured.

These are the three essentials. This lecture is not now concerned with the first two, important though they are, but confines itself to the last, the question of manuring—that is to say, the *artificial* feeding of the crop, the supplementing of the plant foods that are already in the soil.

As the science of manuring progresses we realize that the inherent value of the soil is not of such prime importance as we originally thought, and we find that a poor soil may in a few years be improved out of all recognition, both in its texture and fertility, by judicious cultivation and manuring.

This can not only be done in private gardens where expense is of less object, but it can be done—and fortunately for the country is being done—commercially; that is to say, poor soils are being made to produce large crops, and at a good profit to the cultivator.

It is an undoubted fact that the use of manures is as yet but imperfectly understood in this country. In the first place, we as a nation do not use them in sufficient quantity. This fact is clearly demonstrated in an able and interesting paper recently issued by Professor Middleton, of the Board of Agriculture,* who compares very unfavourably the average produce of an acre of cultivated land in England, with that obtained by Germany and other Continental nations, and shows conclusively that the cause is largely the freer use of artificial manures in those countries.

This fault is one that is easily remedied, and already the best of our cultivators are aware of it, and are using far heavier dressings of fertilizers for their crops than they had been accustomed to apply.

There is, however, another and more serious fault, viz., the improper use to which the different classes of manures are put, arising from a lack of understanding of their ingredients, and of the action they are likely to have on the crop. They are frequently wasted, and even worse, for, as is to be explained later on, if the wrong manure is applied to a crop it may even do harm, and less result may be obtained than if nothing at all had been used. Correct manuring therefore means economy, and the obtaining of full value in increase of crop for the money spent on manures.

Unfortunately, most pamphlets and many books that have been published on this subject confine themselves to bald statements that such and such a fertilizer, or a mixture of two or three, is good for certain crops; no reason for the statement is given, so that the student never gets any further, and is just as much at sea with the next crop as he was with the first.

The object of this lecture is to show, that some system is necessary; a system by which the grower can reason the subject out for himself, and so ensure that the right quantity of the right manure is given at the right time.

The subject of the feeding of crops is a very large one, and touches on many sciences; it is not, however, proposed to go into detail, but to explain the system as briefly and as simply as possible.

* *The Recent Development of German Agriculture*, Wyman, Cd. 8305.

Governing Factors in the Choice of Manures.

In the first place, there are certain factors that govern the choice of manures, all of which must be carefully considered. They are four in number, viz. :—

1. The soil.
2. The crop.
3. The object for which it is grown.
4. The season and length of period of its growth.

The Soil.

All life and wealth spring from the soil. In it the plant grows, in it much of the food material on which the plant depends either exists or is placed, and from it the plant takes its nourishment. Therefore the soil is the grower's raw material, and by his management and manipulation of this raw material he produces the finished article—his crop.

In every other industry the manufacturer pays the most careful attention to his raw material; he knows that his finished article depends directly upon it; he therefore examines it continually, watches it carefully, analyses it, and make it his business to know exactly its composition, how it will behave under certain conditions, and what will be the result of various treatments.

How many growers make a real study of the soil they are cultivating? Do they know what it contains, of what it is deficient, and how it will respond when this or that manure is applied? And yet it is surely as important to their industry as to any other to have an accurate knowledge of the raw material on which they are dependent for their results.

Soils, as every cultivator knows, differ widely. This is easily understood if we look at their origin. They are formed mainly by the disintegration of the various rocks comprising the earth's surface. There are a great number of different rocks and formations in this country, as any geological map will show. These rocks have been formed and deposited under very varying conditions and at widely different periods; some under the influence of great heat, others of great cold, some were deposited under water, others have been transported by glaciers or rivers, some were formed many ages ago and some are of comparatively recent origin, so that it stands to reason that being formed under these varying conditions they must differ largely in composition.

The first duty, then, of the grower is to ascertain as well as he can something of the origin and composition of his soil.

This of course can best be done by analysis, but care must be taken in that case to get the analysis properly interpreted by a capable agricultural chemist. Failing an analysis he should certainly have

RESULTS OF ANALYSIS. VARIOUS.

| Total Phosphoric Acid. | Available Phosphoric Acid. | Total Potash. | Available Potash. | Free lime as carbonate. | Organic Matter. | Containing Nitrogen. | Equal to Azotoma. | Remarks. |
|------------------------|----------------------------|------------------------|-------------------------|-------------------------|-----------------------|-----------------------|-------------------------|--|
| Per cent. .2 to .3 | Per cent. .03 to .04 | Per cent. .15 to .3 | Per cent. .02 to .03 | Per cent. 2.0 | Per cent. .8 to 10 | Per cent. .2 to .4 | Per cent. .25 to .48 | |
| .217 | .016 | .818 | .008 | .273 | 8.48 | .275 | .333 | Soil in high state of fertility. |
| .064 | .012 | .27 | .008 | .34 | 4.9 | .129 | .156 | Hereford—sown, wanted draining, responds to lime. |
| .051 | .038 | .262 | .011 | 1.38 | 6.01 | .164 | .199 | Hereford worked-out farm. |
| .064 | .028 | .378 | .088 | .69 | 6.88 | .165 | .136 | Worcester—responded to phosphates. |
| .256 | .031 | .432 | .007 | .92 | 5.4 | .161 | .133 | Pershore " " " |
| .153 | .007 | 1.015 | .02 | .678 | 10.18 | .206 | .25 | Teabury—good fruit soil. |
| .128 | .015 | .941 | .026 | 45.77 | 17.56 | .18 | .218 | Worcester—old pasture. |
| .14 | .017 | .54 | .032 | .345 | 27.44 | .736 | .593 | North Kent—fruit soil. |
| .076 | .02 | 1.196 | .029 | 6.9 | 9.0 | .157 | .19 | Romney—marsh soil. |
| .12 | .004 | .133 | .04 | .805 | 5.02 | .19 | .231 | East Kent—good potato soil, won't grow fruit without phosphates. |
| .307 | .004 | .084 | .029 | 1.86 | 4.7 | .10 | .121 | Average Guernsey soil. |
| .192 | .01 | .212 | .03 | .48 | 6.3 | .14 | .169 | Kent—trees stunted. |
| .201 | .032 | .42 | .027 | 2.68 | 9.35 | .3 | .364 | Middlesex—club root. |
| .34 | .037 | .40 | .026 | 1.6 | 8.74 | .22 | .267 | " " good. |
| | | | | | | | | " " " |

his soil tested for its lime content, as this is a most important factor. Simple tests for this are given in the pamphlet on the Cultivation and Manuring of the Kitchen Garden, published by the Society, and the whole question of the value of lime in horticulture is dealt with in vol. xlii. p. 236 of the JOURNAL of the Society.

In order to show the great variation of different soils in their contents of the essential ingredients, it is only necessary to glance at the table on p. 349, which is compiled from actual analyses of soils from different parts of the country. It will be noticed that they are all from districts where intensive cultivation is practised.

Having by this means, and by the practical observations of which all growers know the value, carefully studied his soil, the cultivator is armed with his first essential knowledge, viz., that of his raw material.

The relation of this knowledge to manuring is obvious. In the first place, deficiencies must be made good. Where lime is shown to be absent it should be added; if phosphates, ammonia, or potash, are deficient they must be supplied; where, on the other hand, any of them is present in sufficient quantities no more should be given, otherwise not only is the value of such application thrown away, but harm is done by upsetting the balance of the soil, which is of the utmost importance.

For the purpose of ascertaining whether any of these ingredients is present in the proper proportion in any given soil, reference should be made to the type analysis at the head of the table, which is that of an ideal well-balanced soil to which it will be safe to work.

The Crop.

The next point to which attention should be paid is the crop to be grown. This also, like the soil, requires careful study. The cultivator should watch the rooting and growing habits of his crop. If deep-rooted he will know that surface cultivation and manuring alone are no good. He must trench or subsoil for such crops, and dig in lasting manures of an organic nature that will not wash out of the soil. Good examples of such crops among those grown in the garden are parsnips, beet (especially the long variety), carrots, tomatoes, and beans; and among farm crops wheat, mangolds, and beans. Shallow-rooted crops, on the other hand, such as peas, onions, lettuce, and most of the green crops in the garden, and oats, barley, and turnips on the farm, will require soluble or available top-dressings to force them on in the growing season, though these too must have sufficient nutriment under them to ensure a steady growth.

Another point to watch is whether the roots spread outwards or have a marked downward tendency. Fruit bushes and bush trees as a rule spread their roots outwards—they will generally reach as far from the stem underground as the branches do above ground—manures should therefore be distributed all over the soil under the

branches and not be thrown, as is often done, close to the stem. Strawberries, on the other hand, send their roots downwards and only slightly outwards: manures in this case should be applied either on the top of the plants (provided it has been previously ascertained that the particular manure used will not damage the foliage and crowns), or, better still, close round the plants. To sow soluble manures down the middle of the rows of strawberries is to waste the greater part of them, and yet they are often so applied.

All these points should be watched, the object of course being to place the manure where the roots are to be found, so that the plant may obtain full benefit from them.

Students of botany will find a study of the Natural Orders of distinct use to them in this connexion. We know that there is a similarity in flower, fruit, or habit of growth in members of the same Natural Order; and there is a similar affinity in what may be termed their feeding properties—that is, the manure they require. For instance, all Cruciferae require lime and phosphates, the Leguminosae lime and potash, Solanaceae potash, &c.; so that while the Natural Order must not be taken alone as a guide to manuring, it is nevertheless a help when considered in conjunction with the other governing factors.

A point that should always be borne in mind is that all stone fruit requires lime, this element being an essential ingredient in the composition of the stone. The failure of the immature fruit so prevalent at the time of stoning in cherries, plums, and grapes is frequently due to a lack of lime in the soil.

The Object for which the Crop is Grown.

This will be the next consideration, and it is of quite as much importance as those already dealt with, though it probably receives even less attention.

What we have to consider is, Are we growing any particular crop for flower, fruit, or seed; or are we growing it for the production of stem, wood, or leaf?

The correct manuring of a crop depends more closely on this than on anything, and yet many practical men are not even aware of the difference. The importance of it will be seen presently when we deal with the function of the different ingredients of manures; it is sufficient at present to emphasize that the manuring for fruit or seed is entirely different from that for the production of growth of either wood or leaf—in fact, they are distinctly antagonistic, and therefore if the wrong manures are used, not only are they wasted but they actually do harm by accentuating an unbalanced growth that should, by different manuring, have been checked and not encouraged. When a fruit tree is making too much leaf all leaf-producing manures must be withheld and only those calculated to produce fruit be given. This is comparatively simple, as will be seen later.

The Season and Length of Period of Growth.

This is the last of what we have termed the governing factors, and has a very marked bearing on the question. Everybody knows that in the warm spring weather plant growth is more vigorous than at any other time of the year, but, like so many other factors in nature, we are accustomed to take it for granted without ever asking why.

In order properly to understand the reason of the rapid spring-growth, it is necessary to have some knowledge of the action of soil bacteria. It is impossible in the scope of this lecture to deal with this fascinating study, but those interested should read the Masters Memorial Lectures given by Dr. Russell, and published in the JOURNAL of the Society, vol. xli. pp. 173, 188. It is sufficient for our purpose to say that these minute organisms render available for the plant the food materials present in the soil and those we add to it in the form of manures, and at the season of the year when all life, both above and below ground, is waking from its winter sleep, the bacteria are at the height of their activity. Their work is briefly to break down the complicated compounds of ammonia, &c., and present them to the plant in a form in which it can take them up and feed on them. It is obvious therefore that spring- and summer-planted crops will not require such special attention in the matter of manuring as those that have to go through the winter, when the bacteria are dormant and therefore not preparing fresh food for them.

No better instance could be given of this than spring-cabbage, which is planted in September to be ready for use in the early spring. The practical grower dresses his land well before planting out his cabbage, and thus provides food for them through the winter. Among agricultural crops wheat is a good example, and requires more manure in available nitrogen, either in the form of dung or the remains of clover, stubble, &c., than is the case with the later-planted oats or barley.

Every farmer knows that in a cold spring his wheat is apt to turn yellow; this is because the low temperature checks the activity of the bacteria, and consequently the plant becomes temporarily nitrate-starved. To remedy the defect he will give a light dressing of nitrate of soda or sulphate of ammonia.

Similarly mangolds, beet, and parsnips require heavier manuring than turnips, because the latter are later-planted and therefore get fuller assistance from the bacteria.

Closely allied with this question of season is the length of the period of growth of the crop. It is obvious that a crop that is long on the ground, like cabbage, winter beans, parsnips, &c., among garden crops, and wheat and mangolds among farm crops, will require more lasting manures than those that are on the ground for only a short time.

These, then, are the four governing factors which it is imperative to consider carefully if anything approaching correct manuring is aimed at.

The Essential Ingredients of Manures.

In order to apply our conclusions we must next examine the effect on the plant and its growth of the three essential ingredients of manures, viz., nitrogen or ammonia, phosphates, and potash.

Nitrogen is naturally obtained from the decay of animal and vegetable matter in the soil, that is, from the excreta of animals and from previous life, either animal or vegetable. In cultivated soils the chief natural source besides dung is the decay of the residues from previous crops, *i.e.*, roots, stems, and leaves which are ploughed or dug in. Without nitrogen a soil would be absolutely sterile.

The function of nitrogen is to build up the vascular and woody tissue of the straw and stem and the parenchymatous tissue of the leaf, or, in other words, to promote growth of stem, branch, and leaf. Without nitrogen a plant cannot grow; with a sufficiency of it, it will grow vigorously, and if too much is given—especially in a quick-acting form—rapid, soft growth with long joints is produced. An excess of nitrogen tends to lessen fruiting and ripening, the energy of the plant being all turned towards growth.

Of the manures containing a preponderance of nitrogen, which may therefore be calculated to promote growth, the chief are dung, crushed hoof, dried blood, meat meals, fish meal, feathers, rabbit's flick, shoddy, &c., among organic or natural manures, and sulphate of ammonia, nitrate of lime and nitrate of soda among inorganic or chemical manures.

Phosphates are hardly less necessary than nitrogen, and from our present point of view perhaps the most important of the three, as they are present in the soil in very small quantities. Naturally they are derived from the disintegration of phosphate-bearing rocks, by which process phosphates of calcium, iron, aluminium, &c., are formed. Their function, roughly speaking, is the production of blossom and fruit. They induce a short-jointed, hard, and sturdy growth and promote early ripening, a growth and habit diametrically opposed to that encouraged by nitrogen. Phosphate has aptly been described as the bread-and-butter food of the plant, and in addition to its prime value as such it is essential to the well-being of the nitrifying bacteria on which, as already stated, we are so dependent. The chief phosphatic manures are those obtained from bone on the organic side, such as steamed bone meal, concentrated bone phosphate, bone meal, dissolved bone, &c., and basic slag, ground mineral phosphate, and super-phosphate among minerals.

Potash is of the three most naturally abundant, being an essential ingredient of most clays, in which it exists as a complicated compound of silica and alumina, but it is generally deficient in light soils.

Its functions are not so clearly defined as that of the other two, and is therefore more difficult to explain. It plays an important part in the formation of the starch, sugars, essential oils, and other ingredients that the plant stores up in its root, stem, or tubers and in

the fruit and seed. In all cases, therefore, where we grow a plant for the starch or sugar it lays up (as in the case of potatoes, mangolds, and beet), or where quantity and size of fruit are required, we must see that the plant can obtain sufficient potash. It also tends to heighten the colour of both leaves and fruit, and is therefore particularly necessary in the case of apples and tomatoes. Fruit and grain will not swell without potash; in fact, it works with phosphates in this function.

Although an element so widely distributed, the sources of commercial potash are very few, and before the war the world's supply was almost entirely in the hands of Germany, owing to the rich deposits of Stassfurt in that country, from which sulphate and muriate of potash and kainit are mined. Nitrate of potash is sometimes used, but, being a very powerful salt, care should be exercised in its application. Since the war British potash has been produced, and can now be obtained in a very suitable form for horticulture.

The great potash value of ashes from the garden bonfire should always be remembered.

These, briefly described, are the functions of the three essential ingredients of manures. It will be seen that they vary considerably, and while under normal conditions on a well-balanced soil all three work together and assist one another, it is impossible to take an intelligent view of manuring without some knowledge of the effect produced by each of them. Different crops require more or less of one or other of them, and under certain circumstances one or two may be very necessary while another may be distinctly harmful.

FORMS IN WHICH THEY SHOULD BE APPLIED.

Having decided what you require of nitrogen, phosphates, and potash, for the particular crop you are growing, the next consideration is the form in which you should apply them. There are many forms of each on the market, and, as the results of the application of these various forms differ, the amateur must not neglect this point.

His chief consideration will be whether he requires a lasting or a flushing effect; if the former, a slow-acting organic manure must be used; if the latter, a quick-acting mineral will best answer the purpose. For instance, in the case of the cabbage crop the grower will have decided rightly that nitrogen is required for leaf-production; he will therefore put dung or crushed hoof or some similar lasting nitrogenous manure under the crop to carry it through the winter, but will top-dress in the spring with nitrate of soda or sulphate of ammonia to get a quick early growth. Again, in manuring turnips superphosphate in the spring is a suitable dressing, but if phosphates are required for a fruit plantation, some form of bone phosphate (organic) should be used.

It is obvious that in his decision as to the form in which he had best apply his manure the grower will be largely influenced by whether

the dressing is to be given in the winter or spring. Broadly speaking, the lasting manures should be given in the winter and the quick-acting manures in the spring.

The chief consideration is whether the object is to raise the general fertility of your soil, as in the case of a fruit plantation, when winter manures will be given, or whether it is required to hurry on a particular crop, in which case a quick-acting spring dressing will best do the work. Such a case is the application of a soluble potash salt to potatoes, nitrate of soda to cabbages and green stuff generally, soluble phosphates to tomatoes, and the spring manuring of small fruit (especially black currants) to encourage the setting, holding, and swelling of the fruit, and, by keeping up the flow of sap and vigour generally, protecting them from damage by cold winds and frost.

It may be well to say that the idea that winter manures are largely wasted by being washed out of the soil is, roughly speaking, erroneous, if at least the right manures are used and properly applied. These organic slow-acting manures are not soluble until they are acted on by bacteria, and the bacteria are practically dormant in the winter, and only reach the height of their activity when the plant is also actively feeding. Therefore unless the manures are mechanically washed away, which can hardly happen if they are properly buried, the winter rains have little effect on them beyond a certain amount of disintegration, which is desirable.

RESIDUES FROM MANURES.

There is one other point in connexion with manuring which a grower will be well advised to consider, and that is the residues that are left behind from manures after the crop to which they have been employed has been harvested.

It is obvious that where there is perennial growth, as in the case of a fruit plantation, we want constantly to maintain a suitable well-balanced food. The growth and behaviour of the trees must therefore be carefully watched, and any tendency to excessive leaf production must be checked, by an increase of phosphates in the next dressing, &c.

In open land the important point is that the residue should suit the following crop, or be corrected to do so. A good illustration of how this is done by practical growers is the custom of applying a dressing of bones in some form to peas after cabbage. Peas require phosphates to build up their seed, and if these phosphates were not provided, the residues of the heavy nitrogenous dressings given to the previous cabbage crop would tend to produce too much haulm.

It may be well to mention here that many mineral manures, for instance superphosphate and sulphate of ammonia, leave behind an acid residue in the soil which should be counteracted by an application of lime. On the other hand, the residues of all the recognized

organic manures are beneficial in that they add the important ingredient of humus to the soil.

The above, then, are the points that the grower must consider if he is to arrive at a correct conclusion as to how he should manure any given crop. There are of course numerous minor points which it is impossible to deal with in this lecture, but the main considerations have been set out as briefly and simply as possible, having in view the magnitude and complexity of the subject.

The point which it is particularly desired to impress is that *some* such system as is herein set out is essential, and that it is futile to circulate a list of manures or mixture of manures for various different crops without giving the grower any reason for their adoption. Undoubtedly the correct and only way, if the ordinary grower, both professional and amateur, is to take an intelligent interest in the subject, which all the evidence shows he is willing and anxious to do, is to explain the action of the various ingredients of manures and to draw up some system on which the ordinary practical man may work.

This is the object of this lecture, which it is hoped to some extent, at all events, may be attained.

ILLUSTRATIONS.

For purposes of illustration let us now apply this system to a few of the crops most commonly grown.

As in these instances the soil is of necessity an unknown quantity it must be assumed that it is in good balance and therefore in itself calls for no special treatment, though, as previously stated, this is a matter which the grower must first ascertain, and any deficiency discovered must be made good.

Cabbage.—This crop has already been frequently mentioned. It is grown essentially for its leaf, therefore nitrogen must be given. For the autumn-planted crop a lasting form must be given to carry it through the winter, therefore dung, crushed hoof, coarse meat meal or some other high-grade lasting nitrogenous manure must be used. The plant has a shallow-rooting habit, therefore the manure must not be buried too deep. For the quick growth necessary in the spring, available nitrogen must be given, such as nitrate of soda or sulphate of ammonia; some quick-acting manure containing phosphates, such as guano or a soluble organic phosphatic manure, may also be necessary in the spring to make them heart, but available nitrogen is the chief consideration.

Sprouts and Savoys.—For the same reasons available ammonia is essential for these, but owing to their growing season being in the summer they will not require such heavy dressings or such lasting manure as spring cabbage. More phosphates are necessary than in the case of cabbage to induce them to button and heart. They do well on meat meal, fish or meat and bone meal, and may be top-dressed

with guano or a soluble complete manure. If the growth is too slow, a light dressing of nitrate of soda or sulphate of ammonia will be found beneficial.

Cauliflower and Broccoli.—These require more phosphates than other green crops because they are grown for the flower. Some form of bone manure will be found most useful; on soils where it is suitable (notably those of a light or loamy nature rich in lime) superphosphate may be used. It is inadvisable to use superphosphate on heavy soils owing to its bad mechanical effect.

Peas, as has been stated, require phosphates because they are grown for the seed, and for the same reason, and seeing that they belong to the Order Leguminosae, potash also. The soil must not be deficient in lime. They require a little nitrogen to start the growth and to maintain the balance of vigour between the plant and the nodule-bacteria that live on their roots and obtain nitrogen from the air for their host plant. They are shallow rooted, and the manure must therefore not be put too deep.

Beans require similar treatment, but are grosser feeders and more deeply rooted. They grow more woody tissue and therefore require more nitrogen. Dung is frequently ploughed in for them with good results. They also grow well on meat meals.

Potatoes have to make and store up a large quantity of starch in a comparatively short growing period, they therefore respond to potash and a quick-acting manure. They will do better on a soluble artificial manure than on dung, and pay for liberal treatment.

Tomatoes must have phosphates to produce fruit, and potash to swell and colour it. They belong to the Order Solanaceae, which also indicates potash. Too much nitrogen will produce soft growth with a preponderance of leaf and stem.

Onions require nitrogen to give a vigorous growth, and potash to enable them to store the food quickly. They are very shallow-rooted, so top-dressings should be used. Soot will be found to be a good manure for this crop, especially on heavy soils; a high-grade meat meal or dried blood is also suitable.

Cereals.—All want phosphates for the formation of the grain. Winter wheat requires more nitrogen than the other cereals because it has to stand through the winter.

Fruit.—Plums, gooseberries, loganberries, and raspberries are gross feeders and will take more nitrogen than other fruit crops. Lasting manures should be used, such as dung and other nitrogenous organic manures. Plums and gooseberries respond excellently to crushed hoof or high-grade meat meal; a medium meat meal or fish being excellent dressings for loganberries and raspberries.

Apples, currants, and strawberries, on the other hand, must have phosphates; and a meat and bone meal, or bone manures of some sort, will generally give the best results.

In this way every crop may be dealt with, and if the considerations above set out are carefully weighed, a fairly correct estimate of what

is required in the way of manures may be come to, much disappointment avoided, and much money saved. In any case it is a far more satisfactory way of approaching the question than the haphazard method—or lack of method—at present commonly practised.

Quantities.—The question of the quantities of the various manures to be used has purposely been omitted, because it is desired to avoid giving any hard-and-fast rules. The correct quantity of any particular manure to apply will depend on the soil, the crop, the previous manuring, and various other factors ; and this again is a matter that the grower should study for himself.

He is therefore advised to ascertain first from the seller of the manure the quantity advised, and then to inquire locally the quantity generally found to give the best results. He should then experiment for himself, and he will generally find that about half as much again as is generally advised and used is the most economical application. The only exception to this last statement is to be found in the few districts where intensive cultivation is really practised, such as Evesham, parts of Kent, Wisbech, &c., where manuring from a practical point of view is really understood.

Let the grower keep in mind that his object should be to feed the plant with all it wants at all periods of its growth, so as to promote regular, healthy, and continuous growth, leading on to the ultimate aim of the plant, namely, the formation of blossom and fruit. No check should be allowed ; to every call the plant makes the soil should be able to respond ; this is the ideal state of things, and the true science of manuring.

MONOGRAPHS FOR AN AMATEUR GARDENER'S
LIBRARY.

By E. A. BOWLES, M.A., F.E.S., F.L.S., V.M.H.

[Read November 6, 1917; Mr. G. LODGE, F.L.S., in the Chair.]

NOTE.—The books marked with an asterisk (*) in this paper may be consulted in the Lindley Library, at the R.H.S. Offices, Vincent Square, S.W.]

A GOOD definition of a monograph is given in DE CANDOLLE and SPRENGEL's "Elementary Philosophy of Plants." "By a monograph we understand a complete account of any one family, tribe, or genus, nothing being neglected which is necessary for a perfect knowledge of it."

A more concise one is found in Dr. DAYDON JACKSON's "Glossary of Botanic Terms." * "A systematic account of a particular genus, order, or group."

PRITZEL extended a wider use to the word, and in his index of botanical books and pamphlets, "Thesaurus Literaturae Botanicae," * classified as monographs works on single species or forms, and even on the medicinal use of a particular plant.

This practice increases the list to such a length that it would be impossible for us to deal with a tithe of those he mentions. However, many of these works are of too strictly botanical a nature to interest the ordinary amateur, many deal with cryptogams, and others have been superseded by later publications.

Yet, as many amateurs interest themselves in some special genus and are greatly helped by a knowledge of all the books bearing upon it, they would do well to consult the two-score pages PRITZEL devotes to monographs, to find out what works have been published on their chosen branches of study.

I propose to select for notice a few of the monographs on the more popular orders or genera of plants, but to omit those on Orchids, Roses, Fruits and Vegetables, Chrysanthemums, Dahlias, and some other florists' flowers, the publications on which are so numerous that they deserve separate lectures by experts in each branch. Very nearly complete lists of such books are to be found in Mr. HARMAN PAYNE's useful "Florist's Bibliography" * (Wesley, Strand, London, 2nd ed. 1913).

The amateur who has chosen the genus *Iris* for his line of work is fortunate, not only because he will find several books to help him, but, if he can afford one that sells for six guineas, he may be guided and stimulated in his work by what to my idea is the model for all future monographs, Mr. W. R. DYKES' "The Genus *Iris*" * (Cambridge University Press, 1913).

I can only find two faults in it. It is so large, and it costs so much; but both of these are occasioned by its virtues. The life-sized portraits of Irises are very beautiful, and require every inch of its dimensions so as to avoid that sad example of defaced beauty, a folded plate. There are forty-six of these full-page coloured plates of representative or little-known species, besides two others showing various forms of seeds and roots.

If perfection were possible in a monograph, there should be a coloured figure of every species and variety of the plants described; but with such a genus as *Iris* this would mean several large volumes, and we must be grateful for the number of original plates in this, and also for the clear way in which attention is called to figures in other books. This is done by an asterisk preceding the references to descriptions in other works that are accompanied by a figure, both under the accepted name and also in the list of synonyms.

The ample margins, and the arrangement of lists of authors, synonyms, and localities in columns, make it wonderfully easy to find any required reference. The reader is further assisted by the use of the same sequence of parts of the plant in the description of each species, and the commencement of a fresh line for each heading. In many cases outline drawings are given in the text, showing the most important characters.

But the greatest value of the book is due to the fact stated in the introduction, that the writer "refused as far as possible to take anything for granted," and instead of being content to copy the statements of local floras, he determined to examine all the available herbarium specimens, and whenever possible to cultivate the plants himself. The book is therefore rich in original observations, useful to the systematic botanist and also to the cultivator of plants for the sake of their beauty—a rare combination in a book of such importance; for it is seldom that so clever a botanist and so ardent a gardener are combined in one personality to form so good an author.

He tells us, for instance, that the moisture-loving Irises, *Iris hexagona* and *I. fulva*, must be grown in hot and dry places to be induced to flower freely in England: that there are two distinct forms of *I. ruthenica*, of which one flowers well and the other is a very miser of its blooms.

Another of his discoveries is so useful and interesting that I quote his words: "Nature has provided us with one infallible sign which will show us whether an *Iris* is a native of a dry or a wet soil. This will be seen if leaves of *I. Pseudacorus* or *I. versicolor* are held up to the light side by side with a leaf of a *Pogoniris*; for instance, of *I. germanica*. The latter will appear of a uniform green, but the former will show a number of minute blackish spots, which on microscopical examination prove to be due to the fact that at these points the vertical channels in the tissue of the leaves are blocked by growths of apparently the same structure as that which surrounds the passages. The increased

thickness of the structure at these points produces the appearance of the black spots."

For those with more modest purses and ambitions there is the same author's little book "*Irises*" * in The Present-day Gardening Series, at 1s. 6d. (Messrs. Jack). It has eight excellent coloured plates from photographs of the actual flowers, and gives a very fair idea of the more important species suitable for cultivation, and, in chapter xv. on *Irises* that seldom flower, tells of those most people will wish to avoid.

Another very useful book is "*The Book of the Iris*," * by R. IRWIN LYNCH (vol. xxi. of John Lane's Handbooks of Practical Gardening, published in 1904, 2s. 6d.). Until the great monograph came, this was the chief guide for all *Iris*-growers.

The thirty-eight photographic illustrations are all good, but especially those taken purposely for the books by Mr. ALLARD, who was at that time on the staff of the Cambridge Botanic Garden. One feature of this book is a couple of pages and a plate describing the methods of making, and best forms of, zinc labels. I have followed the advice given therein ever since I read it, and, if only zinc were as easily obtained as formerly, I should use no other kind of labels for outdoor work.

Mr. EWBANK wrote a chapter on the cultivation of *Oncocyclus* *Irises* specially for this book, and as he succeeded in growing these, the despair of most other *Iris* lovers, his advice is worth pondering. Even the possessor of the great monograph, should he wish to grow *Irises* well, cannot afford to be without Mr. LYNCH's book, nor should he fail to acquire one of the few remaining copies of the reprint from the R.H.S. JOURNAL of Sir MICHAEL FOSTER's "*Bulbous Irises*" * (1s. 6d., post free 1s. 10d.), published in 1892-3. The substance of it was given as a lecture, and afterwards, expanded and slightly altered, appeared as this little book, which, as far as it goes, is a masterly and pleasantly written monograph of this group.

Then the serious botanist must have Mr. J. G. BAKER's "*Handbook of the Irideae*" * (London, 1892), and so too should the intelligent amateur, for the genera *Moraea*, *Marica*, *Sisyrinchium*, *Gladiolus*, *Crocus*, and others are dealt with, as well as *Iris* itself.

It is the last of a series of botanical handbooks prepared by Mr. BAKER while he was at Kew. They represent many years' work, and stand as a marvellous record of his great services to Botany.

In many of the families dealt with, he evolved order out of chaos, being the first to collect together in a systematic work the references to published descriptions of each species. Further, his position at Kew, and his knowledge of the British Herbaria and those of the Continent, enabled him to describe for the first time great numbers of plants. The first of the series was the "*Handbook of the Fern Allies*" * (Bell, London, 1887). Then came the "*Amaryllideae*" * in 1888, the result of twenty-three years of work in making careful notes on all the specimens

of this Order that passed through his hands in a living state, as well as work among dried specimens. This volume is of importance to most gardeners with a desire to study carefully the families of *Narcissus*, *Galanthus*, *Zephyranthus*, *Sternbergia*, *Hippeastrum*, *Nerine*, *Alstroemeria*, *Crinum*, *Agave*, and their allies.

"The Handbook of the Bromeliaceae" * followed in 1889. It is of less interest to the ordinary amateur, as so few of the genera of this Order provide hardy plants. *Dyckia*, *Rhodostachys*, and *Billbergia* furnish a species or two worth trying in sheltered corners, but *Ananas*, *Tillandsia*, *Pitcairnia* and such require indoor treatment and are not in fashion in these days.

The "Liliaceae" * was only published as separate papers in the Journal of the Linnean Society, extending from the eleventh to the eighteenth volume, 1870 to 1880. These eight papers, if collected, make a very fairly complete monograph of the Order; but, as the author has stated in his preface to the Irideae, he has not included the genera *Smilax* and *Allium*, which had been so thoroughly monographed already by M. ALPHONSE DE CANDOLLE and Dr. VON REGEL.

Thus BAKER's monograph contains:

1. The Gamopetalous genera—*Hemerocallis*, *Kniphofia*, *Agapanthus*, *Brodiaea*, *Hyacinthus*, *Lachenalia*, *Chionodoxa*, &c.
2. Scilleae and Chlorogaleae.
3. Tulipeae, containing *Lilium*, *Tulipa*, *Fritillaria*, &c.
4. Asparagaceae, with *Dracaena*, *Convallaria*, *Clintonia*, *Ruscus*, &c.
5. Anthericeae and Eriospermae, *Asphodelus*, *Eremurus*, &c.
6. Hypoxidaceae.
7. Colchicaceae.
8. Aloineae and Yuccoideae.

Unfortunately there is no separate index to them, yet they are a very useful set of papers when once the user has found his way about in them.

It may be useful to notice now some separate monographs on genera included in these Orders.

In the Irideae there is "The Genus *Crocus*," * by GEORGE MAW (Dulau, 1886, £7). It is as nearly perfect as a monograph can be. Every then known species is figured in colour, though many had to be drawn from herbarium specimens. MAW spent ten years preparing this book, and travelled in Greece, Asia Minor, Italy, Spain, and the Levant in search of *Croci* in their native homes, and corresponded with consuls in many distant places to get others. He cultivated all those he could collect, and drew all the plates, when possible, from living specimens. The tables of specific characters, maps, and chapters on geographical distribution, literature of the genus, and the history and use of Saffron, make the work as complete as possible.

The plates seem to have been drawn and shaded in pencil and then coloured, and therefore the colouring is rather subdued. The outline, however, is wonderfully good, especially in the many dissected

portions, the seed sections of leaf, portions of corm tunic, &c. If there is a fault to be found, it lies in the overcrowding of the plates with these detached portions. It would have been better to have kept them to separate plates, leaving the portraits of each complete plant with a clear margin.

Good as these portraits are, they do not flatter the plants except in two cases, *Crocus ochroleucus* and *C. Malyi*. It may be that MAW had finer forms of these two than are now in cultivation. Certainly I have never seen either species as large or handsome as in those plates.

There have been earlier accounts of the *Crocus*, and I think very highly of Dean HERBERT's "A History of the Species of *Crocus*," * published after his death in vol. ii. part iv. of the JOURNAL of the Horticultural Society of London in 1847.

JOSEPH SABINE's paper * on *Crocuses* grown in the garden of the Horticultural Society, read in 1829, and published in vol. vii. of the TRANSACTIONS of the Horticultural Society, London, in 1830, is interesting, as he describes well many garden varieties of *C. aureus*, *C. vernus*, *C. versicolor*, and *C. biflorus*, some of which have been lost sight of since his day.

JOHN FERDINAND HERTODT's "Crocologia," published at Jena, 1871, is a very curious book. Twenty-six forms of *Crocus* are described in the language of the period and are not easy to recognize. The main portion of this work of 283 pages is devoted to the uses in medicine of Safron. According to HERTODT, it is the panacea for all ills, from hypochondria to toothache, taking arthritis and the plague on the way. It will cure madness and dye the hair yellow. Asthma and cataract fled before it. Of course, you must mix certain other things with it, and long prescriptions are given, including such potent drugs as opium, myrrh, henbane, and aloes. Certain maladies require the worm-eaten wood of oaks, earth-worms dried and powdered, fat of mountain mice or pounded swallows' nests. But in every prescription Safron appears as the all-important ingredient.

In the Order Liliaceae many families have been well monographed. At the head stands "A Monograph of the Genus *Lilium*," * by H. J. ELWES (1880, 10 guineas), a large folio, with forty-eight coloured plates drawn by FRICH. They are fine plates, bold in outline, and in some there is much play of light and shade; yet I do not like them. The artist has a way of making a flower look artificial, as though made of painted calico and not of living sap-filled cells. I think it is due to the abrupt edges of the markings and masses of shade. As instances I call attention to the crimson horseshoes or pitchforks at the bases of the segments in *Lilium monadelphum*. They are so hard and sharp that they appear to have nothing to do with the flower. Or, again, the spots of *L. Humboldtii*. In my copy some of the yellow, white, and red paints have turned black. This is a pity, for the text is so authoritative and complete in information up to the date of publication that it is worthy of better-coloured plates.

In the absence of an index, except to the plates, and the pages and plates being unnumbered, it is difficult to refer to. I hear rumours of a supplement bringing the family up to date, and that Mr. GROVE is helping with it. We have a foretaste of his powers in his small book "Lilies" * (vol. viii. of The Present-day Gardening Series, published by Messrs. Jack), a charming book full of good advice and useful hints—as it should be, seeing that the writer knows and grows Lilies better than anyone. In the preface Mr. ELWES testifies to his success in these words: "I can say with truth, that neither the late Max Leichtlin nor Mr. G. F. Wilson, the two great Lily-growers of the past, knew as much about the cultivation of Lilies as he does."

The eight plates from coloured photographs are excellent, considering their size. The Lilies are usefully divided into those easy and those more difficult to manage, and the addition of a list of those not yet in cultivation completes the account.

"The Book of the Lily," * by W. GOLDRING (vol. xvii. Handbooks of Practical Gardening, London, 1905, John Lane, 2s. 6d.), is a handy, inexpensive guide to Lily-growing. The eighteen photographs of the illustrations are not very good, poor specimens or very small groupings having been used for most of the subjects. The chapters on planting and propagating Lilies are especially practical and useful.

Miss JEKYLL has written a charming book, "Lilies for English Gardens: a Guide for Amateurs" * (The "Country Life" Library, 1901, 8s. 6d.). Like all of her books, this contains a wealth of beautiful photographs, showing fine groupings and garden effects of well-planted Lilies, blossoms or cut flowers, and the flowers only of many species. Several of these last are from drawings. It is just the book that makes the reader wish to grow the plants it tells of, and suggests to his mind possible ways of grouping them in his garden.

"Notes on Lilies and their Culture," * by Dr. WALLACE (2nd ed. 1879, Colchester, 5s.), contains a great deal of information, both original and collected. One especially useful chapter is the eighth on Lily Bulbs, from F. W. BURBIDGE's paper in "The Garden," * vol. xi., revised by Dr. WALLACE. The excellent illustrations are from BURBIDGE's drawings. The systematic arrangement and notes on species are mainly taken from Mr. BAKER's synopsis in the *Gardeners' Chronicle*, 1875.*

There is no need to mention books on Tulips, as Mr. JOSEPH JACOB has so lately given us such a complete and excellent bibliography. It is arranged according to the dates of publication and occupies twenty-two pages, and forms chapter viii. of the "Report of the Tulip Nomenclature Committee," * 1914-15, recently published by the R.H.S., price 2s. 6d.

One of REDOUTÉ's greatest works is entitled "Les Liliacées," * but is not strictly confined to plants belonging to that order as we now classify them, and many Irises, Sisyrinchiums, and Crocuses are included, as well as Amaryllids, such as *Crinum*, *Narcissus*, *Nerine*

and the Snowdrop. Cannas, Musas, an Orchid or two, Commelinas, *Alisma*, and the Pineapple are instances of plants from Natural Orders other than the Liliaceae.

It is, anyway, a magnificent book, one of the finest ever produced, and one of my most precious possessions is a very fine set of its eight volumes, with the plates in two states: in plain black on buff paper; and also the coloured print, retouched by hand.

There is some mystery as to the exact history, date, and number of the issues of this book.

The first issue appeared during the years 1802-1816, and was sold in "livraisons" containing six plates each, at 40 francs—eighty such parts completing the work.

Later REDOUTÉ started a second style of issue, and explains its aim and character in a preface in these words:

"Je ne m'étais d'abord flatté que de l'espérance de conserver avec le plus de soin possible les seules couleurs dont la gravure nous permit alors de faire usage. Instruit par l'expérience, je publie une seconde édition peu nombreuse, mais aussi parfaite que l'art me semble pouvoir la produire, comme le résultat de tous mes efforts pour représenter encore plus fidèlement les belles fleurs de la plus riche famille des plantes. Pour attendre ce but j'ai perfectionné les moyens employés par la gravure; j'ai composé les couleurs avec un meilleur choix, et j'ai ajouté moi-même, avec le pinceau, les délicatesses de nuances que lui seul sait bien rendre dans toute leur fraîcheur: † j'ai joint à tous ces perfectionnements celui de marges plus spacieuses, qui permettront aux tiges de se déployer avec plus de grâce et de liberté.

"Quoiqu'il soit vrai de dire que cette édition ne soit pas un autre ouvrage et qu'elle ne diffère pas essentiellement de celle que le public a daigné accueillir avec bonté, l'on ne peut dissimuler cependant que les quarante exemplaires que j'annonce ne soient bien plus parfaits, bien plus précieux pour les amateurs d'une science enrichie tous les jours par l'étude de Botanistes justement célèbres. Si j'ai le bonheur d'obtenir les suffrages des uns et des autres, mes travaux, qui n'ont pas été sans peines, ne resteront pas sans quelque gloire."

It would appear that he did not obtain the support he hoped for, as in the superb copy belonging to the Lindley Library there is a pencil note in the margin "Dix-huit seulement. REDOUTÉ."

These two issues apparently ran concurrently when once the major examples began to appear. REDOUTÉ was only the artist who provided the plates, the text of his great works being written by various French botanists of the period.

That of the first four volumes of his Liliacées, as stated by PRITZEL, was written by AUGUSTIN PYRAMUS DE CANDOLLE; vols. v.-vi., by FRANÇOIS DE LA ROCHER; and vii.-viii., by ALIRE RAFFENEAU-DELILE. His plates are so wonderfully beautiful that his name is the one remembered. He was the inventor of the process of colour-printing

† L'on conçoit qu'il serait impossible de faire ces retouches au pinceau pour une édition nombreuse.

that he used, and alludes to it in the *avant-propos* of his book, "Les Roses." *

"Le procédé que nous avons inventé en 1795, pour imprimer les planches en couleur, n'a aucun rapport avec celui que Bulliard a mis en usage dans son ouvrage des *Champignons*. Le sien, qui n'était qu'une imitation de la manière de Leblon, consistait dans l'emploi des couleurs, sur plusieurs planches, pour l'impression de chacun de ses sujets.

"Le nôtre, au contraire, consiste dans l'emploi de ces mêmes couleurs, sur une seule planche, par des moyens qui nous sont particuliers, et que nous nous proposons de publier un jour. C'est ainsi que nous sommes parvenues à donner à nos gravures tout le moelleux et tout le brillant de l'aquarelle, comme on peut le voir dans nos *Plantes Grasses*, dans nos *Liliacées*, et dans nos autres ouvrages."

Whatever the method was, no pains were spared to make the impression perfect. I have been told that the plates were washed and repainted in the natural colours after each impression. This produced a stipple engraving, and if a powerful lens is used to examine a portion of one of these, it is astonishing to note what a vast number of minute dots are required to form the outline of an anther or even a tooth at the edge of a leaf. Then a wash of colour was applied by hand to certain portions and some of the shadows were strengthened. He was such a master of light and shade that no other flower-artist has surpassed him in representing the natural pose of his subjects and making them stand out with such an idea of relief.

Allium is so well monographed by Dr. REGEL that BAKER, as I have already stated, did not think it necessary to include the genus in his monograph of the Liliaceae. It is dealt with by REGEL in two works, "Alliorum adhuc cognitorum monographia" (Petropolis, 1875), and "Allii species Asiae centralis" (Petropli, 1887). They are strictly botanical works, chiefly in Latin, with notes in German, and were published in "Acta Horti Petropolitani," * vols. iii. and x.

Another book from Petrograd is "Eremurus: Kritische uebersicht des Gattung," by Mme. OLGA FEDTSCENKO (1909, 6s. 6d.), a large quarto with twenty-four plates, and a most careful piece of work. The references to published notes given under the heading "Literatur," after the Latin diagnosis of the species, are wonderfully complete. The plates are from outline pen-and-ink drawings showing various portions of the plant, treated from a botanical and not an artistic point of view, and are excellent for their destined purpose.

The *Yuccas* are splendidly monographed in "The Yuccae," * by WILLIAM TRELEASE, in the Thirteenth Report of the Missouri Botanical Garden (1902). It is a fascinating paper, clear and authoritative, replete with references to earlier works, figures, and localities, and beautifully illustrated with eighty-seven photographs, many of which present the plants growing in their native surroundings. Others show seedpods, seeds, and seedlings, and others a few flowers separated from the spike.

In 1907 he issued "Additions to the Genus *Yucca*" * in the Eighteenth Annual Report, Mo. Bot. Gard., chronicling some further notes on species already dealt with and on two new and undescribed species, *Yucca decipiens* and *Y. Endlichiana*.

The latest work on this genus is "Le Yucche," by G. MOLON, Milan (1914, fr. 6.50, 12mo). It is but a small manual, but contains eight coloured and fifty-three black-and-white figures. It chiefly presents us with TRELEASE's work in a shortened form, and in Italian. Many of the illustrations are reproductions of his plates. Its value lies in a key to the species based on the nature of the stems and leaves. This, as the author states, is of more service in Europe, where, except *Yucca aloifolia*, the plants do not bear fruit; TRELEASE's key being based on the differences of the fruit-vessels for its main divisions.

Also, Dr. MOLON gives every known specific name and synonym in alphabetical order, and includes the numerous garden hybrids raised by SPRENGEL at Naples. These last form the subjects of the coloured figures and a few of the photographic ones.

Compared with Liliaceae, few genera of the Amaryllidaceae have been well monographed. As already stated, many have fine portraits in REDOUTÉ's great work.

Dean HERBERT, who made a special study of bulbous plants, has left, as the chief monument of his labours, a book that is of great interest to any studying this Order, viz., "Amaryllidaceae" * (London, 1837, 8vo, with plain plates, £2; with coloured plates, about £3 10s.). It is mainly a botanical work, but full of cultural hints, for he grew and watched with a keen eye a great number of rare plants. The plates have no artistic value, and for the most part represent only portions of flowers or leaves. Those drawn from herbarium specimens are coloured in the faded hues of the dried flower before him.

Of separate genera, *Narcissus* has received most attention. The most serious attempt at a monograph is "The Narcissus," * by F. W. BURBIDGE and J. G. BAKER (L. Reeve, London, 1875, 8vo, £1 10s.). The main portion consists of a review of the genus by BAKER, published in the *Gardeners' Chronicle* in 1869, revised and brought up to date by the author for this book. The late Mr. BURBIDGE contributed introductory chapters on the history, cultivation, diseases, and species and varieties, of *Narcissus*. Those who knew him, or who recognize the charm and interest of his writings, will feel this work is full of his personality. His knowledge of the old English books on plants makes his notes on the varieties very valuable.

He also contributed forty-eight coloured plates, which are better if judged from a botanical than an artistic standard. His outlines and dissections are very good, but his method of shading was crude and heavy, and the reproduction, as to colouring, is very poor, a smudgy hand-colouring on lithographed plates; the green tints being suggestive of juvenile efforts.

A smaller and more up-to-date book is "The Book of the Daffodil," * by the Rev. EUGENE BOURNE, vol. xvi. of *Handbooks of Practical*

Gardening (published by John Lane, 1903). It is full of useful information from cover to cover. The chapters on How to form a Collection, Certificated and other fine varieties, as well as those on cultivation, are particularly good. The photographic illustrations are excellent.

Then Mr. JACOB has written the Daffodil volume of The Present-day Gardening Series.* It is a brightly written book, full of interesting chapters, such as The Daffodil in Books, History, Raising new Varieties, The R.H.S. Classification, Lists for different purposes, and a Calendar of Operations. The eight coloured plates in this volume are, I think, the best in any of this well-illustrated series of books.

The fullest account of the Snowdrops is to be found in a monographic sketch of the genus *Galanthus*, by Dr. GÜNTHER RITTER BECK v. MANNAGETTA, in the *Illustrierte Garten-Zeitung*,* February 1894, Vienna; but unfortunately it is unobtainable and also in German. It is a careful piece of work and brings together a mass of references.

In English the best is BURBIDGE's paper read before the Royal Horticultural Society, March 10, 1891, and published in vol. xiii. part ii. of the JOURNAL. He gives a capital alphabetical list of the then known varieties. The late Mr. ALLEN's and Mr. MELVILLE's papers in the same volume also provide useful facts.

The *Clematis* is the subject of five works, three of which call for notice. The oldest is "The Clematis as a Garden Flower,"* by THOMAS MOORE and GEORGE JACKMAN, published at the Woking Nursery, 1872, and a new and revised edition in 1877, with two coloured and fifteen black-and-white plates, many of which are by W. G. SMITH.

It is a trifle old-fashioned by now, both in style of illustration and subject-matter, but the descriptive notes on species and varieties are still very useful. A new and up-to-date edition with photographs of all the varieties would make a good book.

Of course, a great deal is said about the beauty and uses of *Clematis Jackmannii*, and rightly so, for it is not easy to overpraise this grand plant. It is interesting to notice that the author declares it to be a seedling, the female parent being a *Viticella* type.

The next writer, M. ALPHONSE LAVALLÉE, declares this plant is none other than a Japanese species, *C. hakonensis*, and much has been written on these different views. Anyway, "Les Clématites à grandes fleurs"* is a good book. Its title tells us it is a "Description et Iconographie des espèces cultivées dans l'Arboretum de Segrez." It was published in Paris in 1884 as a 4to, and contains twenty-four beautiful plates drawn from life and lithographed by Mlle. BERGERON.

There are charming reproductions of very clever pencil drawings. It is difficult to make an artistic plate out of one flower 6 inches across on a quarto page, and these drawings are worth studying by anyone anxious to succeed in this line. The smaller-flowered forms are beautifully treated, especially in the foreshortening of the fully shaded flowers and the delicacy of outline of the more lightly treated leaves.

The dissected portions, and especially the seed heads, are most admirable work.

The text is the result of much careful research and a knowledge of the living plants, and treats the *Clematis* purely from a botanical and classificatory point of view.

Mr. ROBINSON, on the contrary, has given us the horticultural side in his beautiful little book, "The Virgin's Bower: *Clematis*, climbing kinds and their culture at Gravetye Manor" (London, 1912). As with all his books, it is a pleasure only to touch the fine paper before enjoying the clear print. Three beautiful reproductions of photographs make one long for more. The kinds dealt with are arranged more or less in alphabetical order of their specific names. Some rather weird English names are provided, as, for instance, the Hairbell Virgin's Bower for *Clematis campaniflora*, where Bell-flowered would have been a translation of the Latin; and I prefer Nicholson's translation of Vine Bower for *Viticella* to the pre-Linnæan sentence, Virgin's Bower of the South of Europe.

The book is a pleasant record of the successes the *Clematis* family have achieved at Gravetye.

The year 1916 brought two important works on Japanese Cherries. One is E. H. WILSON'S "The Cherries of Japan" (Publications of the Arnold Arboretum, No. 7). It is the result of special investigations carried out during the Arnold Arboretum Expedition to Japan in 1914, and deals with ten species, three of which produce most of the large-flowered forms of our gardens. *Cerasus pendula*, the well-known weeping Cherry, and the winter-flowering tree known as *Miqueliana* and *microlepis* are stated to be varieties of *Prunus subhirtella*. The eight half-tone reproductions of photographs of specimen trees show what grand subjects for our gardens these would be could we only obtain them on their own roots.

The second book is vol. xxxiv. art. i. of Journal of the College of Science, Imperial University of Tokyo, "Japanische Bergkirschen, ihre Wildformen und Kulturrassen," by M. MIYOSHI, published in Tokyo. The text is in German, and to me its charm and value lie in the twenty-one plates at the end, four of which are photographic representations of fine specimen trees, one an outline drawing of *Prunus mutabilis*, and the others coloured figures of a great number of varieties, chiefly of *P. mutabilis* and *P. serrulata*. WILSON has lately written a supplement to his work, altering some of the nomenclature, as Miyoshi's work just antedated his.

Those who wish to study the Geraniaceae have a wealth of literature to guide them. First, there is "Geraniologia," * by CHARLES LOUIS L'HÉRITIER (Paris, 1787-88), a large folio containing forty-four copperplate engravings of *Erodiums*, *Pelargoniums*, *Geraniums*, and *Monsonias*. They are by different artists, but thirty-two are by P. J. REDOUTÉ, and beautiful examples of his skill. The delicacy of his treatment of the finely cut leaves of *Erodium supracanum* is well worth studying. The nearer leaves stand out in a wonderful

way, being almost black, so close and heavy are the lines. The leaves farthest away have no outline, and the lines that shade them are so fine that they appear as the softest possible grey, and the whole effect is a wonderful piece of perspective.

Other plates are by JAMES SOWERBY, PERNOTIN and others, and all of them beautiful; but it is easy to see at a glance which are REDOUTÉ'S.

The text for this work was never published, and, according to PRITZEL, the manuscript was in the Candolle Library, and some pages containing descriptions of twenty-six species of *Erodium* were in the Banksian Library.

Whoever has a copy of ANDREWS' "*Geraniums*" possesses another beautiful book. The title runs "*Geraniums, or a monograph of the Genus Geranium, containing coloured figures of all the known species and numerous beautiful varieties, drawn, engraved, described and coloured from the living plants,*" * by H. C. ANDREWS, 1805, two volumes, 4to. There should be 124 of these brilliantly coloured plates, but complete copies are very scarce, and fetch £25 and upwards.

Almost all the plants described and figured are *Pelargonium*, though all are named *Geranium*.

In SWEET'S "*Geraniaceae*" we find 500 of the most beautiful hand-coloured, copperplate engravings ever issued. There are five 8vo volumes, published 1820-1830, entitled "*Geraniaceae: the Natural Order of Gerania,*" * by ROBERT SWEET, F.L.S. The delicacy of the drawing is delightful, the minute hairs on stems and leaves and the silky down of the seed vessels are marvels of skill and patience. This may be well examined in T. 34, *Pelargonium coriandrifolium*. Many of the plants figured are hybrids raised under cultivation, or, as SWEET calls them on the title-page, "beautiful mule-varieties cultivated in the Gardens of Great Britain."

Lastly, bringing together the earlier work, there is a monograph of the whole family by R. KNUTH (Part 129 of vol. iv. of ENGLER'S "*Das Pflanzenreich,*" * published Leipzig, 1912, 32 Mk.). It is another instance of the patient labour of German scientists, and wonderfully correct and complete as to references to descriptions and figures. It is a purely botanical work, and although indispensable to anyone seriously studying any of the genera of the family, not otherwise a book that the ordinary amateur gardener would enjoy.

I have always considered the genera *Geranium* and *Erodium* particularly beautiful and useful for English gardens, and believe much might be done in crossing and selecting good seedlings among certain of the species, and I recommend this branch of gardening to amateurs who wish to work among a family of plants easily grown in the open air. A year or two of work with the living plants will teach the keen-eyed amateur that even German scientists do not know everything, and that careful collection of facts in books and herbaria do not furnish all that is needful to make a good monograph.

The "*Pflanzenreich,*" however, is the most important series of

botanical monographs published in the present century ; and though, with two exceptions, the sixty-one parts so far issued are in German, with Latin diagnoses and critical notes, certain parts dealing with plants important for gardens are of great service to amateurs interested in those families.

The great value of these lies in the excellent keys, not only to the genera, but to the sections of large genera and the species of each section, and the mass of references to literature and geographical distribution.

There are a few outline figures in the text which are good in representing dissections, so good and so few as to make one wish for more.

In times of peace it was easy to purchase the various parts separately, if desired ; and, in the hope that it may be possible again before very long, I give a list of the more interesting families included in those published already :

- Part 10. Tropaeolaceae. By Fr. Buchenau.
- „ 14. Cistaceae. By W. Grosser.
- „ 17. Lythraceae. By E. Koehne.
- „ 22. Primulaceae. By Pax and Knuth, 1905.
- „ 26. Droseraceae. By L. Diels.
- „ 27. Polemoniaceae. By A. Brand.
- „ 28. Scrophulariaceae, Antirrhinum and Calceolaria. By F. Kränzlin.
- „ 33. Liliaceae, containing Asphodelus, Aloe, Kniphofia, Gasteria, Haworthia. By A. Berger.
- „ 34. Sarraceniaceae. } By T. M. MacFarlane, and in English.
- „ 36. Nepenthaceae. }
- „ 40. Papaveraceae. F. Fedde.
- „ 53. Geraniaceae. R. Knuth, 1912.
- „ 61. Umbelliferae, Saniculoidcae, containing Eryngium and Astartia. Hermann Wolff, 1913.

THE ACTION OF ONE CROP ON ANOTHER.

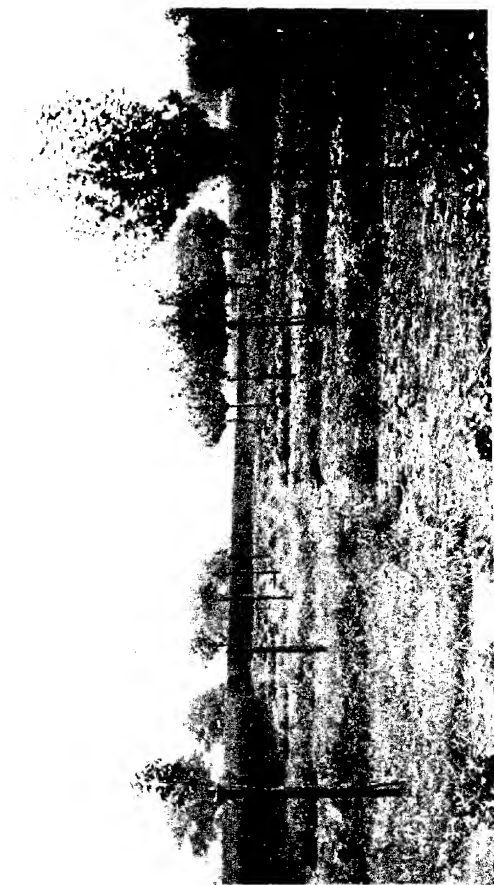
By SPENCER PICKERING, F.R.S.

[Read before the Scientific Committee, Feb. 26, 1918.]

THE problems connected with the action of one crop on another have been engaging our attention at the Woburn Experimental Fruit Farm for over twenty years, and it is, naturally, impossible in a short article to give more than a very imperfect outline of all the experiments made on the subject.

The work originated in observing the great effect which grass had on fruit trees, and the conclusion drawn almost from the outset was that this effect must be due to some toxic action. But it will be well, in the first instance, to disarm criticism on two points: there can be no question but that the extent of the effect of grass on trees varies very greatly under different conditions—the nature of the soil, the nature of the trees, and probably the meteorological conditions, and all the facts which have been ascertained about the action, render such variations inevitable: indeed, it is quite possible that in some cases the prejudicial action of grass might be nil, though (with the exception of a partial instance, to be mentioned below) no such case has come under our observation: in various instances where there has apparently been no action, the results, on examination, have been lacking in some, or all, of the elements of precision which would justify conclusions being drawn from them. The second point is that toxic action does not necessarily involve the idea of any poison, being exuded from the roots: such exudation may occur, but there is nothing as yet to prove it; plant-growth, however, is accompanied by the formation of much detritus: this accumulates in the soil, being there decomposed by chemical and bacterial agency, and eventually, as we know, enriches the soil; but it must pass through many phases before this point is reached, and some of the intermediate products of its decomposition appear to be harmful to vegetation.

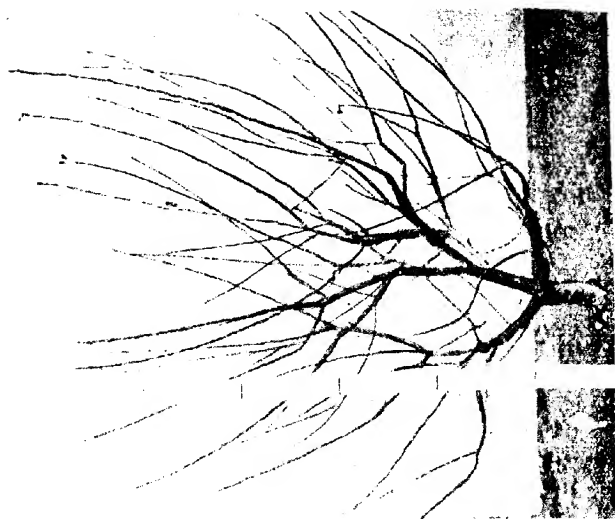
That the baleful effect of grass on trees at our farm is very great, there can be no question. Fig. 54 shows results of grass having been sown round some standard apples immediately after they had been planted, the photograph having been taken three years later: and fig. 55 illustrates a similar result with dwarf apples. It was not expected that such an effect would be produced on trees after they had become well established in the ground, but the effect was, as a matter of fact, found to be just as great; the trees then grassed over had been growing for four years in tilled ground, but as soon as the grass grew,



Grass.

No grass.

FIG. 51.—EFFECT OF GRASS ON STANDARD APPLE TREES THREE YEARS AFTER PLANTING.
[To face p. 22.]





Festuca in trays.

No festuca in trays.

FESTUCA PRATENSIS.



Without grass in trays.

With grass in trays.

TOBACCO.



Without clover in trays.

With clover in trays.

TOBACCO.

FIG. 56.



all growth practically ceased, and in the case of the weaker varieties, such as Cox, the trees were actually killed within two or three years. A similar result was obtained when the laying down to grass was postponed till thirteen years after the trees had been planted: the plantations in this case contained trees of sundry varieties of apples and pears, grown both as standards and dwarfs, and, whilst the different varieties showed great differences as to the extent to which they were affected, the general results may be gathered from the fact that the value of the crops from the grassed section was, during the four succeeding years, only 41 per cent. of that from the sections which had remained ungrassed, and, as in the previous case, some of the trees were actually killed. Yet another experiment was made on a plantation of standard trees of Bramley's Seedling after they had been established for twenty-two years, being then remarkably fine specimens of this variety. The grass did not come up well, but, in spite of this, the trees in the grassed section showed the effect even in the early part of the summer of the first year, by a marked difference in the appearance of the foliage, clearly visible from a considerable distance, whilst, later in the season, the effect was still more apparent by the grassed trees losing their leaves two or three weeks earlier than the ungrassed ones. The crops, also, were found to have been adversely affected by the grass.

Thus, the deleterious effect of grass in our soil is independent of the age of the trees when the grassing over is effected.

The peculiar effect of grass on the colour of the foliage is paralleled by its effect on the colour of the bark and the fruit: this effect is distinctive, and, being unlike that produced by lack of water or nourishment, suggested from the first some toxic influence. As regards the fruit, a lack of colouring matter is evident in the case of some varieties, but in others the change consists of an alteration in the colour, the green giving place to a red pigment. Such a change may be beneficial from the point of view of the grower, and, provided the action is not excessive, grass may also benefit the grower by causing increased cropping; for, as is well known, limited injury to the tree often results in increased productiveness. What is best for the tree is not always best for the grower.

The injury to the tree affected by grass is not confined to the case of apple trees: precisely similar results have been obtained with every kind of tree investigated: pears, plums, cherries, oak, beech, ash, spruce, larch and fir, with the last three, even when they are grown in a light sandy soil best suited to their welfare.

Our search for the explanation of the effect of grass on trees consisted, in the first place, of an examination and exclusion, one by one, of the various causes which might be suggested for the action. Of these space will allow only of the mere enumeration of the majority: the alterations produced by grass on the aëration of the soil, the carbon dioxide content of the soil, the temperature of the soil, its possible alkalinity, its physical condition, and its bacterial condition; and in all these cases negative results were obtained. A little more

may be said, however, as to the examination of effect of grass on the supply of water and food reaching the tree.

That the growth of grass is accompanied by the evaporation of much water from the soil is well known, and, though this may generally result in the soil below grass becoming drier than that where the surface is kept tilled, this is by no means always the case, for, though water is lost by the physiological action of the grass, the grass protects the soil from a loss of water due to physical causes—the action of sun and wind—and the balance of these opposing actions may sometimes be in one direction, sometimes in another. As a matter of fact, it was found that, in the case of the original grassed plots of apple trees at the farm, the soil under the grass was, during the two years when observations on this point were made, actually wetter than that in the neighbouring tilled plots, so that lack of moisture could not be the explanation of the effect in this case. Numerous other direct experiments have been made on the subject, and all led to the same negative conclusion: where the trees were benefited by additional water, those in grassed ground were benefited to the same extent as those in tilled ground, but the additional water, even when supplied from below the roots of the trees, so that they should receive it before the grass, did not obviate the deleterious action of the grass. The most conclusive evidence on this point was obtained by growing trees in large earthenware pots, when, by weighing the pots every day or two, the water contents could be kept up to some definite standard, or altered to a known extent.

The question of nutrition is intimately connected with that of the water-supply, for in a fertile soil, so long as the trees are not in want of water they cannot lack nutrition. That the growth of grass impoverishes the soil in our experiments cannot be maintained: the grass, when cut, is not removed, but is left to rot on the ground, and direct analysis of the soil has shown that, in accordance with what has been established elsewhere, grassed soil is actually richer than the tilled soil; and this has been further established by finding that trees will flourish better in soil which has grown grass than in soil which has not done so. Thus, if the trees under grass are suffering from starvation, it is starvation in a land of plenty; and this is just the characteristic of toxic action—the presence of some baleful agent which prevents the plant from assimilating such nourishment as is present.

As in the case of the water-supply, pot experiments have been found most useful in examining the question of the food-supply, and special attention may be drawn to certain of these. Several series were made wherein the trees were grown without grass or with grass, and, in cases where grass was present, the grass roots were, in some instances, allowed to intermingle in the usual way with those of the tree, whereas in others they were prevented from so doing by a layer of very fine copper gauze placed four or five inches below the surface of the soil, all the water and nourishment supplied being added from below, so that the trees could take what they wanted before it reached the grass. Yet this almost complete separation of the grass from the trees failed to diminish

appreciably the baleful effect of the grass. Subsequently the separation was made quite complete by growing the grass in separate iron trays, which fitted like a collar round the trees on the surface of the soil: the trays were perforated at the bottom, a sheet of fine copper gauze being placed over the perforations to prevent any downward passage of the grass roots. It was impossible with such an arrangement that any effect which the grass might have on the trees could be explained by its sucking up the water and nutriment from the soil in which the trees were growing, but must have been due to what passed downwards from the grass to the trees; yet the deleterious effect of the grass persisted with scarcely any abatement. The results of various series of such experiments may be summarized as follows, the growth of the trees without grass, measured in various ways, being taken as the standard of comparison, and represented by 100:

| | No Grass. | Grass. | | |
|------------------|-----------|--------------------|--------|------------------|
| | | No Gauze or Trays. | Gauze. | Trays and Gauze. |
| Vigour | 100 | 59 | 61 | 66 |

The effect of the grass, it will be seen, diminishes somewhat as the separation of it from the tree-roots becomes more complete, but only to such a small extent that it may well be due, not to the more perfect separation at all, but to the reduced vigour of the grass itself, consequent on its growth having been restricted by limiting the extension of its roots; for in numerous other experiments, which cannot be quoted here, it was shown, as might have been anticipated, that the baleful effect of surface growth is more or less proportional to the vigour of that growth.

By using a collar with a larger central opening, the arrangement just described was adapted to growing plants other than trees in pots, with and without surface growth; and in these cases the trays were made of earthenware, their construction being evident from a glance at fig. 56. The perforations in the trays were covered, as in the former case, with a layer of copper gauze, and in all the check experiments there were similar trays with gauze, containing the same weight of earth as those wherein a surface crop was grown. The pots measured 16 inches in diameter internally, and contained about 70 lb. of soil, the trays containing 20 lb.; all the water supplied was added to the trays, and allowed to soak down through them into the pot below, the pots being kept up to the standard weight by frequent weighings.

In this way it was ascertained that the deleterious action of grass on trees was only a special instance of a general action: sixteen kinds of plants have been examined as regards their sensibility to the effect of surface growth, and all have been found affected; whilst the various plants grown as a surface crop number six (not counting different varieties of the same species), and all have been found to behave in a

similar way. One or two of the results obtained are illustrated in fig. 56. The extent to which surface growth affects a plant varies between wide limits, according to the nature and vigour of that growth, and the nature and vigour of the plant affected: the smallest effect observed has been a reduction of 15 per cent., the greatest, one of over 99 per cent.; the average reduction in these pot experiments is over 50 per cent., and is approximately equal to that observed in the case of the action of grass on trees.

Special mention may be made of one experiment which appears to be a crucial one in establishing the fact that the damage done to the plant in the pot is caused solely by the action of something produced in the soil by the surface crop. In this there were two sets of pots with the perforated trays, as in other cases, one carrying a surface crop, the other without such a crop, but there were also two similar sets wherein the perforations of the trays had been blocked, so that no leachings from the surface crop could reach the plants in the pots below. Where the passage of the leachings was thus prevented the presence of the surface crop had no effect on the plant in the pot, instead of reducing its vigour by 63 per cent., as was the case where the leachings were allowed to reach the plant (fig. 57).*

Two points of importance must be noticed: it is highly probable, both from general considerations, and also from a consideration of the results of our experiments, that different plants differ both in their susceptibility to the action of surface growth, and to the effect produced by them when grown as a surface crop (cf. the different extent of the action of grass and clover as illustrated in fig. 56): but positive proof of this is very difficult to obtain, since for any such comparison we must have both plants and surface growth of a like degree of vigour in the cases to be compared together. The second point is that the action of surface growth is equally apparent when the plant affected is of the same nature as that constituting the surface growth as it is when the plants are not the same; indeed, so far as our results can tell, the action of a plant on one of its own nature is even greater than its action on one of a different nature; but, for the same reasons as those given above, positive proof of this can hardly be obtained.

If a plant can affect others of its own nature, it is clear that it must affect itself, and it is, therefore, impossible to grow any plant without it suffering from its own poison. The plants grown in the pots when there is no surface growth in the trays must suffer in this way, and the reason why they suffer more when there is growth in the trays, is that they are not only subjected to the influence of the toxin produced by

* In a similar experiment quoted in the *Annals of Botany*, xxxii. 112, a reduction of over 99 per cent. was observed. This is explained by the fact that the experiment in question was carried out in the winter, when growth was so slow that the toxin had an abnormally long time in which to act upon and stunt the young plants.

It will be seen from the illustration here given that the growth of the plants in the pots is not so satisfactory when the trays are not perforated as when they are: this is due to the difficulty in properly adjusting the water supply in such a case. The plants in the unperforated trays also suffer, owing to the toxin formed by them not being washed away.

themselves, but also to that produced by the plants in the trays, which must generally amount to two or three times that produced by the plants in the pots.

Ample evidence could be adduced to show that the fertility of soil is eventually increased by growing crops in it, provided that the crops are not allowed to exhaust the soil: it follows, therefore, that any toxic effect produced by the growth of a plant must be of a temporary character only, and that the toxin must become changed, probably by oxidation, into plant-food. Many general instances might be quoted in support of this fact, but this is hardly necessary; we may, however, quote one particular experiment carried out in pots which illustrates this point very forcibly. Trees grown in soil which had not been grassed were compared with others grown in soil from an adjoining plot of ground which had been under grass for many years, and the vigour of growth of the latter was found to be over twice as great as that of the former; but when they were grown in this same fertile soil with the turf replaced on the surface, their vigour was reduced to half of what it was in the less fertile soil without grass. The soil from the grassed land was beneficial, and it was only while the grass was actually growing in it that it was toxic.

The disappearance of the toxic property is apparently rapid: in experiments with trees in pots, when the washings from the grass in the trays, instead of being allowed to run immediately down to the roots of the trees, are collected in a separate pan, and not supplied to the trees till some hours afterwards, they are found to have lost their toxic properties, and, possibly, to have acquired some slightly beneficial property; even the interposition of a layer of two inches of pumice between the soil in the pots and the trays carrying the surface crop, when these trays are still *in situ*, allows sufficient oxidation of the leachings to produce an appreciable reduction in the toxic effect. A similar result was obtained in some experiments in the field, when trees were grown in tilled ground, and in ground which was grassed under different conditions. The effect of the grass, when it entirely covered the roots of the trees, was to reduce the vigour of the latter from 100 to 5 in the course of four years, but when the grass was not allowed to come within three feet of the stems it produced an actually beneficial effect at first, the toxin formed by the grass having time to become oxidised before reaching the tree roots, and it was only after two years, when the roots began to extend into the grassed area, that the toxic effect began to be felt.

RELATIVE VIGOUR OF TREES.

| | 1910. | 1911. | 1912. | 1913. |
|---------------------------------|-------|-------|-------|-------|
| Ground tilled | 100 | 100 | 100 | 100 |
| Ground turfed | 70 | 30 | 6 | 5 |
| Turfed to three feet from stems | 132 | 145 | 78 | 61 |
| Allowed to grass over | 101 | 38 | 12 | 10 |
| Turfed and fed | 69 | 30 | 9 | 28] |

Two other experiments in this series are quoted, though they do not bear directly on the particular point now being dealt with: in one the grass was allowed to re-establish itself gradually, instead of the turf being replaced at once, the result being that the deleterious effect also became established only gradually; in the other the turf was replaced, but was fed off first by sheep, and then by poultry; yet this feeding off effected no reduction in the toxic action except in the last year, when the reduction was explicable by the grass above two of the trees having been almost entirely killed by the poultry.

The action of one plant on another being a general one, it follows that trees should be prejudicial to grass, just as grass is prejudicial to trees. We have been able to establish this by pot experiments, in which grass was grown in the pots, and apple seedlings grown as a surface crop in the trays. That in ordinary practice crops under trees suffer is well known, and the following experiment shows that this cannot be fully accounted for, either by the shading due to the trees, or by the exhaustion of the ground by their roots. A plot of ground which was partially and irregularly occupied with fruit trees of different sizes, mostly standard apple trees, was selected, and, after due preparation, was planted with Brussels sprouts. The areas of the patches of ground under the trees varied from four to eighteen feet square, and similar patches were selected in parts of the ground where there were no trees, and a shading effect, certainly greater than that produced by the trees themselves, effected by erecting over them canvas screens. At the same time other patches of the ground were marked off where trees had been growing, but had been cut down just before the sprouts were planted, the roots being left undisturbed in the soil. The results of two years' observations showed that the sprouts under the trees were only 70 and 50 per cent. as vigorous as those in the unoccupied ground, but that this reduction in vigour was not in any way attributable to the shading, for those under the screens showed no reduction at all; nor could it be attributed to the exhaustion of the soil by the growth of the trees in it during the previous twenty years, for the sprouts planted on the sites from which the trees had been removed gave, on the average, exactly the same values as those planted in ground where no trees had been growing; indeed, during the first season, they actually flourished better.

RELATIVE WEIGHTS OF BRUSSELS SPROUTS.

| Situation. | 1915. | 1916. |
|--------------------------------|-------|-------|
| Open ground | 100 | 100 |
| Under trees | 72 | 52 |
| Under screens | 100 | 103 |
| On former tree sites | 112 | 89 |

Important evidence bearing on the question of toxin production by plant-growth is afforded by the results obtained on investigating the character and behaviour of soil which has been heated.

If the growth of plants in soil produces a toxic substance, we should expect that some toxin must exist in all soils under normal conditions. That such is the case has been established by our examination of heated soils. When a soil is heated to various temperatures short of that at which destruction of organic matter begins, the proportion of soluble matter, both organic and inorganic, in it increases rapidly, and the soil becomes toxic to plant growth, and also to the germination of seeds; and, from a comparison of the amount of soluble matter present after heating to different temperatures, it is clear that such changes must extend down to ordinary atmospheric temperatures, that is, that a certain amount of such toxic substances must be present in soils which have not been heated by artificial means. This is also shown by the fact that seeds germinate more easily in a wet inert medium than in soil. As to the toxicity of heated soils, there can be no question: when freshly heated soil is examined by its effect on the germination of seeds, it is found that it retards this germination, so that the period of incubation is increased by nearly 100 per cent. when the temperature of heating has been 150° C. (curve 0 in fig. 58). But this toxic effect disappears after a time; forty-four days after the heating its retarding effect is greatly reduced (curve marked 44), and after 106 days it has nearly entirely disappeared. When the toxic properties of the heated soil are examined by growing plants in it, the results are, in consequence of this reduction of toxicity with time, as well as of certain bacterial changes consequent on the heating, somewhat obscured, for the growth of the plants occupies a much longer period than the germination of seeds, and during this period the toxicity is rapidly disappearing. When the temperature to which the soil has been heated is not high—these temperatures are marked on the pots in fig. 59—the proportion of toxin is not large, and it becomes more or less completely oxidized into food-material before growth progresses very far, so that we get an increased vigour in such cases; but where the temperature has been higher, and more toxin is present, its effect is more persistent, and becomes apparent from the stunting of the plants. This was still more evident at an earlier date in the growth of the plants, though, unfortunately, no photographs of the results were taken then, but a photograph taken at a later date is enough to show that, as time goes on, the toxic effect diminishes, and the plants in the more highly heated soil, though still somewhat stunted, have outstripped in weight those in the less heated soil, giving clear proof that much more food-material must have been available in their case, and that the only reason why it did not operate at an earlier date must have been the existence of some adverse circumstance preventing the plant from benefiting by the food which was there: that is, that some toxic influence was operating. Similar results with other plants were obtained, telling the same tale.

That the toxicity of heated soils is due to the decomposition of the organic matter in the soil cannot be doubted, and a like decomposition must occur, though less readily, at ordinary atmospheric temperatures. Indeed, the germination results prove that so-called unheated soil

contains some toxin), and, as most of the organic matter in soil is the product of plant-growth, it follows that more toxin will be produced where plants are growing than where they are not, hence the toxic effect of one plant on another. The ultimate decomposition of the toxin into food-material, demonstrated by the results with heated soils, also explains the increased fertility observed in a soil which has grown a surface crop, as soon as that surface crop is removed, and the production of toxin ceases.

What the toxic substance is, has not yet been ascertained, but as

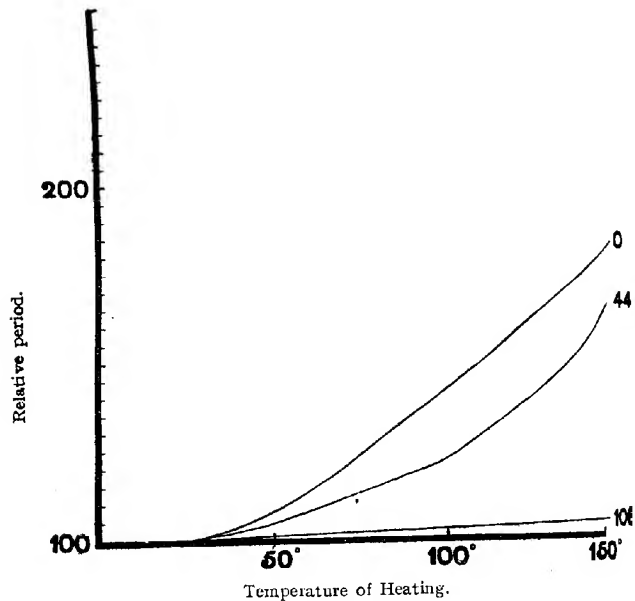


FIG. 58.—INCUBATION PERIODS OF SEEDS IN HEATED SOILS.

examination of it is now in progress from the chemical point of view. Those experiments, of which some account has been given here, go to prove that the toxin is a substance which can be oxidized, or, in chemical parlance, that it is a reducing body, and it has been found that there is such a body present to a certain extent in extracts from all soils, and that the proportions of it are increased by growing a crop in the soil, or still more so, by heating it. But the question is evidently one of great complexity which cannot be dealt with in the present communication; it may be said, however, with confidence that the toxin is not dihydroxystearic acid, which, according to the views expressed by workers in the Soils Bureau of the United States, is the main substance accountable for the infertility of certain soils.



Tobacco, July 28.



Tobacco, August 25.

FIG. 52.—TOBACCO GROWN IN SOIL WHICH HAS BEEN HEATED TO DIFFERENT TEMPERATURES.

[To face p. 380.

THE FUTURE OF ALLOTMENTS.

By W. H. MORTER, F.R.H.S.

[Read August 14, 1918; Mr. F. J. CHITTENDEN, V.M.H., in the Chair.]

I HAVE been requested to give you a short paper on the Future Aims for Allotment Workers in Industrial Centres. This subject, to me, seems such an important one and one full of such possibilities for the benefit of the town-dweller, not only for the production of food in the future, but also for the physical benefit of the allotment holders, that I think a short history of the work done under the Cultivation of Lands Order in my own city would be of interest. Up to the end of 1910 there were about five thousand allotments in the city—between 3,000 and 4,000 under the control of the Corporation, and the remainder privately owned. At the commencement of the year 1917 the Cultivation of Lands Order was issued, and under that Order various plots of land—some that had lain derelict for years, and others awaiting building development—were immediately taken possession of and laid out in plots. It was anticipated that a further 2,000 plots added to those already under cultivation would be ample for all requirements, but such was the demand that by the end of April (or in four months) not fewer than 6,000 new plots, representing 600 acres of land in various parts of the city, had been laid out and put under cultivation. Although the demand was not yet satisfied, it can be imagined that to obtain land for the purpose was getting extremely difficult, for not only were the land agents and owners averse to giving up the land, but, as most of the grass land in and around the city was let to the various wholesale butchers &c. as accommodation land at high rents, the problem faced us as to whether it would be just and proper to utilize this land for allotments. After consideration, it was decided that more food could be produced by cultivation than if left in its present condition as accommodation land, and much of this land was then taken under the Second Order of February 1917, although at the same time due consideration was given to the tenant so that he should still have a portion left on which to graze his diminished supply of cattle. Sundry farm lands that were not being cultivated to their fullest capacity were also taken and divided up. Under this scheme a further 6,000 plots, making altogether 12,000 War Allotments, have been put under cultivation in eighteen months, and yet there is still a demand for more and more. When the scheme was first put into work the city was divided into thirty districts, and thirty experienced men were appointed to take charge of a district each, their duties being to plot out the land and let it to suitable applicants and also to give instruction in cultivation, as it was obvious there would

be many applicants from a big city anxious to grow their own supplies, who would be totally ignorant of the proper way to dig and cultivate a plot. This scheme has worked remarkably well, and I think I am perfectly safe in saying that out of this large number of new plots (many in the hands of inexperienced people) not one per cent. can be found improperly cultivated. This, I think, shows the necessity of providing for this kind of cultivation in the future, and I suggest the question of the provision of suitable land for allotments after the termination of the War is a subject that will have to be seriously considered by Municipal Authorities throughout the country, but more especially by those of large cities and towns.

It has been stated by some well-known authorities that the demand may probably decrease after two or three years, as for instance in the case of Croydon, where a large number of allotments were demanded and provided about twelve years ago and which gradually fell out of cultivation, so much so that at the present time these plots are lying idle; but I should like to point out that the necessity for growing food in these islands twelve years ago was not comparable to the needs of the present day. At that time and for some years after, so much food was imported and home-grown stuffs could be obtained so cheaply that individuals were not inclined to cultivate their own; but, at the present time, the need for reducing the imports and increasing the food supply in our own country is of paramount importance, and in my opinion this need will continue, not only for the duration of the War, but for some years after, owing to the great shortage of transport. Again, the great benefits that are being derived by the plot-holders, not only by supplying their own wants with fresh vegetables and fruits, but also to their general health, will not be readily forgone; and I submit, therefore, this provision is one that should be taken in hand at once, so that, when the present War Allotments are required for building purposes immediately the ground is released by the Board of Agriculture, Municipal Authorities should be in such a position that they will be able to transfer the holders to other suitable land that will be held permanently for this purpose.

How can this be arranged?

Many Municipal Authorities now have certain powers given them by the Local Government Board under the Town Planning schemes, and I suggest that, when the plans for these schemes are being prepared, certain areas of land should be obtained in each district for the provision of allotments. I think a reasonable amount should be not less than twenty acres for every thousand houses to be erected, and these plots should be in such a position as to be easily accessible. This will provide a plot of 300 sq. yds. for each fourth house only, and it may be argued that under the Town Planning there will be adequate ground provided for each house, but I am of opinion that such ground will be more often used for the cultivation of flowers and lawns than for food production, and that such areas for vegetable-growing as I have suggested would be eagerly taken up.

In some of the larger cities this proposition may seem absurd, as in Birmingham, for instance, it would probably mean about 5,000 acres to be provided; but however large the scheme appears at first sight, I am of the firm opinion that this land would be readily taken up and cultivated. The land chosen for the purpose should preferably be of good tilth; but I consider the first essential is to have the areas for allotments in near proximity to the dwellings, or at least within fifteen minutes' walk of transport, such as trams, buses, &c. At the present time in Birmingham we have men working allotments—and working them exceedingly well—whose homes are from six to eight miles from their plots, but it is only those who are very keen that are doing this, and the majority of allotment-holders could not give the time and attention required to their plots if too far away from their homes; the question of carriage to and fro should also have a big influence.

The most suitable sites to be obtained for this purpose would be land with a good depth of soil and preferably facing south, but this cannot always be arranged. However, whatever the position of the ground, the main roadways should run due east and west, so that the plots can be arranged to meet this road endways, and the crops could then be planted with rows running north and south. The plots I suggest most suitable for permanent allotments should be 200 to 400 sq. yds., and arranged so that a two-foot path can run between every pair of plots for the convenience of the owners on each side.

Huts.—The present habit of placing huts in any position on an allotment is most deplorable, and I suggest that those in charge of allotments should insist on these huts being placed in such a position as to be properly in line, preferably on the side of the main roads leading into the allotments. These could be so arranged that one hut of say 12 by 5 feet would answer for two allotments with a partition in the centre. They should also be made more or less to an approved design. This would be not only more pleasing to the eye, but also more convenient for the owners. Municipalities should be able to arrange to supply these huts either at cost price or at a yearly rental.

On each block of allotments I consider it is also necessary to have a good building which could be used for storage of artificial manures, or for any meetings of the allotment-holders connected with the plots adjoining.

Pigs.—The question of keeping pigs and other live stock on allotments is one bristling with many difficulties, but I suggest this should be encouraged wherever possible. In many cities by-laws have been so stringent as to make it almost impossible for any householders to keep pigs near their homes, but these have now been considerably relaxed for the period of the War. There is little doubt, however, in my mind, that on the return to normal conditions these by-laws will be again put into force. It therefore behoves every block of allotment-holders to consider the advisability of making such provisions as may be necessary, either for pig-keeping on the co-operative principle or by

erecting such buildings as may be necessary for this purpose. I am afraid any other live stock, such as rabbits, chickens, &c., could not be kept any distance from home in the proximity of large towns for reasons that will be obvious to you all.

Fruit.—I do not consider it would be wise to recommend any holder of war plots to plant fruit, as the expense incurred would be wasted should the land suddenly be required for other purposes; but on permanent plots I would certainly recommend that bush fruits should be planted to assist with the food supply.

Flowers.—The growing of flowers on an allotment at the present crisis would probably be regarded as pleasure-gardening at the expense of the community for the sole benefit of the individual. This may be so in many cases, but where a plot-holder resides in the centre of a densely populated city, I certainly think a small corner of the plot should be put aside for this purpose, so that he should be enabled to grow something that would brighten the home as well as increase the food supply. I think sometimes too much fuss is made when a small portion of an allotment is given up to flowers without first considering their real value, although, when an allotment-holder has a garden adjoining his residence, he certainly should not want any space on his allotment for this purpose.

Security of Tenure.—Many representations with reference to this point have already been made by different councils of the Board of Agriculture and Fisheries, and only recently the following letter has been received by Mr. REGINALD GRAVES, clerk to the Tottenham Urban District Council, from Mr. PROTHERO :—

"I am directed by the President of the Board of Agriculture and Fisheries to refer to your letter of the 1st instant, enclosing petitions asking for security of tenure in respect of land which has been provided for allotments under the Cultivation of Lands Orders.

"I am to point out that the Corn Production (Amendment) Bill, which has been introduced by the Government into the House of Lords, is intended to postpone Part IV. of the Corn Production Act, 1917, which would otherwise come into operation on the 21st August next, and to continue in operation until the end of the war the provisions of the Defence of the Realm Regulations under which the Cultivation of Lands Orders have been made. The result of passing the Bill will be that the Board, and the local authorities acting on their behalf, would be able to retain possession until the end of the war of any land which has been taken over under the Order, and the provisions of the Defence of the Realm (Acquisition of Land) Act, 1916, will enable possession to be retained of such land for the period of two years from the end of the war.

"The Government have, therefore, redeemed their promise that legislation would be introduced to safeguard the position of the allotment-holders, and as soon as the Bill is passed they will be secured in the continued occupation of their land, at least until the expiration of two years from the end of the war, except in those cases where it

is shown to the satisfaction of the Board that the land is required before that date for building or other public purposes. If it should be necessary to dispossess any allotment-holders for such purposes they will be compensated by the Board for the value at the time of quitting of the crops growing on the land and the labour expended upon and manure applied to the land since the taking of the last crop in anticipation of the future crop.

"With regard to the position of permanent allotments after the war, I am to state that the Government recognise fully the social and moral advantages of the allotment movement, and that it is their desire to take any necessary steps to establish it formally as a permanent feature of our national life. It is not practicable, however, to introduce further legislation on this question this session, but in the meantime the legislation already introduced will safeguard the position of the present allotment-holders, and will renew the power of the Board and the local authorities to acquire more land during the continuance of the war."

This, to the allotment-holder, is a very strong point, and in connexion with this some extracts from a letter sent to one of the daily papers are worth quoting, viz. :—

"Allotment-holders are to be given security of tenure of their allotments until the autumn of 1920.

"Those who desire it ought to be given security of tenure *for the rest of their lives*, conditional on their allotments being tilled by themselves or resident members of their families.

"The national exchequer would, of course, have to buy out the landlords at an equitable price. Is this too big a proposition when millions of pounds are spent for far less valuable purposes than intensive cultivation of British soil?

"Public playgrounds are sacred, but food production has become more sacred. The difficulty as regards allotments situated on valuable building sites could be solved by grants of other allotments of equal size within the same radius of holders' homes.

"The patriotic allotment-holders have converted wastes into oases and barren lands into rich kitchen gardens. They have immeasurably helped out the anxious food problem. Every one of them is a lesser HONDDA or HOOVER.

"And their love of their patches of ground has become that passion of the gardener that exceeds the devotion to any other work or hobby. We cannot think of a day when all the allotment-holders will be told, 'You must surrender now.' One cannot imagine a gardener leaving his garden for ever on the striking of a clock. If we do not give the allotment-holders their allotments we ought to keep mobilized at least an army corps of official ejectors for that day."

This, I think, expresses the general feeling of the allotment-holder throughout the country, and for the needs of the food supply for some years to come there will be an urgent call for greatly increased production, as in the event of a blockade of our coast-line we should find

the home produce so infinitesimal that in a very short time the inhabitants of these islands would be reduced almost to a state of starvation; and when we consider that many of these inhabitants would be only too pleased to do their share towards this increased production, if only security of tenure could be assured, I am sure you will all agree with me that we must all do our best to bring about this necessary improvement in the provision of land for allotments and the necessary security for these workers.

Waste Land.—We are informed that there are 17,000,000 acres of uncultivated land in these islands, but, unfortunately, this land is situated in such positions generally as to be of little use to the inhabitants of large towns; but I suggest one has only to spend a few hours on the outskirts of any municipality to find still plenty of land that could be put to much better uses than at present, and if this could be obtained for allotment purposes, the food supply would be thereby considerably increased both for the benefit of the workers themselves and also to benefit the country generally.

The scheme just being put into operation by the Board of Agriculture, viz. the formation of Horticultural Committees for certain specified areas to have control under the Board and to be empowered to elect District Food Production Committees to work in conjunction with them, is in my opinion good; but there are other points which should be considered and added to the scheme. For instance, the scheme brings forward the necessity for the establishment of trial grounds in various districts where new varieties of vegetables &c. could be tested side by side with established and well-known varieties, so that the local allotment-holder would be able to tell at once whether these new varieties were more suitable to him and for his district without wasting at least a season in testing them himself. The Parks Committee of the Corporation of Birmingham in conjunction with the Royal Horticultural Society have already put this scheme in working order, and six trial grounds of from one to five acres in extent have been established in the Parks in six different districts in the city for the benefit of the allotment-holders to show the results on the various soils on which this city stands. I suggest this measure should be encouraged by the Royal Horticultural Society in other cities, as it is obvious that, however anxious, it is certainly impossible for the societies affiliated or that will affiliate, if far distant from the Wisley Gardens, to visit them, and I suggest that by encouraging the extension of demonstration plantings of this kind the Society will be doing good work for the country, and will at the same time still further advance its laudable aims.

I suggest also that Societies should be encouraged by temporary loans to purchase their own plots, this giving them a still keener interest, and much can be done by co-operation, both in the purchase of lands, tools, manures, &c.

The panel lecturers appointed in the various counties should be called upon more frequently, especially during the winter months.

not only for giving lectures, but also for chats on the cultivation and growth of various varieties of plants for food production suitable to their particular districts, as it is obvious that those living in a certain district are the best judges of the crops which thrive best in their own locality, whilst at the same time special lecturers should be appointed to visit the districts and deal with more general subjects.

The Education Committees of the various cities would, I feel sure, be only too pleased to assist in this good work by giving permission for the district schools to be utilized for these lectures at any time.

THE EFFECT OF THE FROSTS OF THE WINTER OF 1916-17 ON VEGETATION.

By E. A. BOWLES, M.A., F.L.S., V.M.H.

At the meeting of the Scientific Committee on April 11, 1917, it was agreed that it would be desirable to collect evidence of the damage done to plants by the cold of the winter just past, and that a report should be drawn up from the result. This recommendation was accordingly brought before the Council of the Society, and having been approved, the following letter was circulated:—

VINCENT SQUARE,
WESTMINSTER, S.W.1.
June 1917.

DEAR —

The last winter (1916-17) has been so prolonged and the frost so exceptional in many places that injury to vegetation is said to be widespread. Further, the nature of the injuries is represented as being different in character and degree from the experience of 1908-9, and also to plants other than those noted in the report published by this Society after that winter.

The Council consider it to be desirable that a report should be drawn up dealing as fully as possible with the present damage, that it may, when convenient, be published in the R.H.S. JOURNAL, and has requested me to collect details on the subject. Will you, therefore, kindly fill up the enclosed forms, and return them to me at Vincent Square at your early convenience. Additional forms will be sent if requested.

It is especially desirable that notes should be collected on plants introduced since 1908, but older plants mentioned in the former report (see R.H.S. JOURNAL vol. xxxvi., Part II., p. 358, Nov. 1910) should also be included for comparison.

I am, yours truly,
E. AUGUSTUS BOWLES.

Forms A. and B. were similar to those sent out for the Frost Report on the winter of 1908 and 1909 (see JOURNAL of R.H.S., vol. xxxvi., Part II., p. 366 *et seq.*). Form C. asked for information as to plants killed or injured in 1908-9 but which in 1916-17 escaped injury, or survived with but slight injury. Form D. was prepared for lists of plants introduced to cultivation since 1908, and arranged to show whether they had been injured or no.

Considering the difficulties besetting garden work at the time, the response to this request was sufficiently general to warrant drawing up this report.

The thanks of the Society are herewith tendered to all those who so kindly and so carefully filled in the forms, or provided the required information in other ways.

Special thanks are due to Mr. VICARY GIBBS, who most kindly and generously placed at our disposal a valuable report on the effects of the winter at Aldenham.

He was intending to publish it, along with a list of the plants injured or uninjured, in the gardening press, but, on hearing that the R.H.S. proposed drawing up a report, he at once expressed his willingness to allow his work to be incorporated with it in any manner we deemed most desirable.

EFFECT OF FROSTS OF WINTER OF 1916-17 ON VEGETATION. 389

FORM A.

SCHEDULE OF QUERIES.

1. Locality of garden.....
 2. Height above sea-level.....
 3. Is the surrounding country open.....
or
Is the garden sheltered by hills, &c. ?.....
 4. Is there any large body of water near ?.....
 5. Has the garden suffered any great damage from frost during the winter of 1916-17 ? If possible, please say how the amount of damage compares with that experienced in previous severe winters.....
.....
.....
 6. What were the lowest temperatures recorded during the winter ?
(1) On Grass.....date..... (2) In Screen..... date.....
If the thermometers are placed in positions other than these, please give exact situation and exposure.....
 7. Have the thermometers been verified at Kew ?.....
 8. If not, are the thermometers ordinary minimum, or " Six's " ?.....
 9. How do the temperatures compare with those experienced during other winters ?
.....
 10. How long did the frosts last ?
.....
 11. Was snow on the ground at the time, and how much ?
.....
 12. What was the general character of the autumn months in the district ?
.....
 13. What is the nature of the soil and sub-soil ?
.....
 14. Please give any further particulars regarding the climatic conditions that you think may be of service in drawing up the report ?
.....
.....
- Name..... Address.....
.....

FORM B.
LIST OF PLANTS INJURED BY FROST DURING WINTER 1916-17.

| 1 | 2 | 3 | 4 | 5 | 6 |
|----------------|--------------|------------------------------------|-------------------------------------|-----------------------------|----------|
| Name of Plant. | Approx. Age. | Situation with regard to Exposure. | How long Planted in this Situation. | Extent of Damage. A, B, &c. | Remarks. |
| | | | | | |

The following abbreviations may be convenient :—
A = above ground ; B = below ground ; W = west ; E = east ; N = sheltered all round ; X = wet at roots ; Z = dry.
C = cut ; G = killed to ground level ; H = killed outright ; I = much injured ; D = slightly injured.

FORM C.
 PLANTS KILLED OR INJURED IN 1908-9 (see "R.H.S. JOURNAL," vol. XXXVI, Part II, p. 366 et seq.) BUT WHICH IN 1916-17 ESCAPED
 INJURY; OR, SURVIVED WITH BUT SLIGHT INJURY.

| 1 | 2 | 3* | 4 | 5* | 6 |
|----------------|-----------------|--|---|---------------------------------|----------|
| Name of Plant. | Approx. Age. | Situation with regard to Exposure. | How long Planted in this Situation. | Extent of Damage. A or B. | Remarks. |
| | | | | | |

The following abbreviations may be convenient:—

Column 3.—N = exposed on north; S = south; W = west; E = east; X = sheltered all round; Y = wet at roots; Z = dry.
 Column 5.—A = escaped injury; B = survived with but slight injury.

His introductory article is printed herewith in full, and the lists of plants have, with his consent, been incorporated in the general list.

THE WINTER OF 1916-17 AT ALDENHAM, ELSTREE, HERTS.

"The winter of 1916-17 was the most severe that has been experienced since that of 1894-5, and I consider that it offers a fair test of hardiness; I mean that any plants which survived it at Aldenham with no, or slight, injury may be tried with fair prospect of success in almost any part of England.

"At no time during last winter was the thermometer abnormally low; the lowest reading at Aldenham was three degrees above zero in a screen protected from the north, whereas in January 1895 we touched three degrees below zero; but the disagreeable feature of last winter was a continuance of bitter east wind which, if not fatal to plant life, resulted in severe damage, defoliation, and disfigurement. Indeed, any one who examines the following lists will be struck by the small number of shrubs or trees which have actually perished.

"As will be seen, I have divided the plants into those which are uninjured, slightly injured, severely injured, and killed. This sounds simple enough, but in practice it is not so easy to decide what constitutes severe injury as would appear at first sight. The natural way would be to regard severe injury as having occurred where a plant has been killed to the ground level, or at any rate has had the branches and a good deal of the stem destroyed, and this is the view which, generally speaking, I have adopted.

"Such a happening is, however, of very diverse effect in the case of plants of quite different character; e.g. a Cypress, Juniper, or other Conifer so suffering is for all practical purposes ruined, and in the case of a broad-leaved tree such as an Ailanthus, though ultimate recovery may be possible, yet the growth of years may have been destroyed, and the symmetrical form definitely spoilt. On the other hand, in the case of Fuchsias, Perowskias, Caryopteris, and most of the Hypericums, being killed to the ground is a very ordinary event which takes place with me in much milder winters than the past, and which does little or no harm to the subject; indeed in some cases, where the plant has become scraggy, is an actual improvement. Writing as I do towards the end of July, I find plants of this nature which undoubtedly were killed to the ground, but which have grown again so vigorously that anyone who looked at them without minute investigation would pronounce uninjured.

"Aldenham seems to me for more than one reason a place where catalogue such as follows should form a good test of hardiness, and a guide for those proposing to plant a garden in the colder parts of England. It is no doubt very gratifying for Mr. WILLIAMS at aerhays or Sir JOHN ROSS at Rostrevor to show their friends magnificent examples of *Embothrium coccineum* or *Desfontainea*

spinosa, but disappointment would follow an attempt to emulate their successes in Staffordshire or Northants.

"Aldenham, however, is a fair average place for climate, not the very worst, but some ten degrees colder than favoured parts of Surrey and Sussex; it has a cold clay subsoil, practically without lime, does not suffer specially from winds, a moderate rainfall of 24 inches average in the year, and therefore on the dry side, is subject to very bad spring frosts, and enjoys all the variability of English weather, so that in the last ten years we have registered frost in every month of the year.

"With this explanation before them your readers will be able to judge what are the conditions under which plants have either lived or died in Herts. The collection there is so extensive with regard to all hard-wooded plants that are generally reputed hardy, save for Conifers and peat-loving shrubs such as *Rhododendrons*, which are unsuited to the soil, that with these exceptions, and a few great rarities, I think it will be possible for anyone to find out the fate of any hardy tree or shrub in which he may be interested.

"Of course in the limits of an article such as this it would be quite out of the question to enumerate all the inhabitants of the Aldenham gardens. I have therefore omitted nearly all quite common species which have escaped uninjured, though where they have suffered in any degree, such as the common holly, yew, and *Mahonia*, they are listed.

"I have also left out all varieties (a goodly number) except in the few cases where I have satisfied myself that the variety is harder or tenderer than the type: an illustration of the former is *Viburnum foetidum rectangulum*, which has come off much better than the type, and of the latter *Rhus Cotinus atropurpureus*, which has been more heavily punished than *R. Cotinus* itself. It is not easy to see why plants of the same species with differently coloured flowers or differently shaped leaves should vary in hardiness or other qualities, but undoubtedly the golden-coloured *Cupressus macrocarpa lutea* is harder than the type, and the copper- or brown-coloured beech thrives better on our heavy clay soil than the ordinary *Fagus sylvatica*.

"I must also mention that the lists refer, unless otherwise stated, to *mature* plants, for the difference in the effect of hard frost on trees in a young state with no vigorous root development and little, if any, really hard wood, and others of the same kind when 20 feet high is most marked, e.g. my tree of the new Chinese *Paulownia tomentosa lanata*, nine years old and 20 feet high, and the Chilian *Nothofagus obliqua*, about twelve years old and about 18 feet high, are entirely unscathed, whereas little plants of the former 8 inches to a foot high have been killed, and thirty plants of the latter in the nursery from 5 to 7 feet high have almost all been severely injured, the majority being killed half-way down.

"The moral of this for inexperienced planters is obvious, viz. that many trees require protection during the first eight or ten years

of their life, which thereafter can be safely left to look after themselves; the protection may be afforded by bracken or matting or merely by the close vicinity of other plants, but this story proves that trees not of extreme hardiness should not be isolated as specimens till they have reached a certain height and age.

"This last winter's severity was the more felt because it followed on several of unusual mildness; for instance, *Acacia dealbata*, which had been given me by some Cornish or Irish friend, had grown vigorously with me for five years, and had developed into quite respectable size, but was of course killed stone dead early this year. - All of us had thus been tempted to try delicate things, and though most of them have now been swept away, yet some few startling successes have occurred, and new and valuable experience has been gained.

"I have always understood that for several years after it was first introduced the Tulip tree was supposed to be tender, and it was only by an accident that its hardiness was discovered; in the same way on the walls at Kew Gardens can be seen specimens of plants now of proved hardiness, which must have been assumed to require a wall for their salvation when first brought to England.

"The common horse-chestnut and the Mexican *Choisya ternata* are well-known instances of plants far hardier than their natural habitat would suggest.

"This year has furnished one or two unexpected revelations. *Lomatia ferruginea*, which I should never have even thought of trying had not my friend Mr. GERALD LODER given me a plant, though only a small cane about 2 feet 6 inches high, is absolutely untouched, and *Paliurus aculeatus*, which I had tried and lost many years ago, had only two or three twigs slightly scorched. It is true that I have only one plant of these, and as ARISTOTLE remarks, no doubt recording a then ancient proverb, 'one swallow doesn't make summer'; nevertheless that twenty-nine degrees of frost should have left undamaged these two plants placed at hazard in the shrubberies, with no other protection than that afforded by neighbouring plants, is distinctly surprising and encouraging.

"I may state here that the ensuing lists only concern plants growing in the open without artificial protection of any kind (unless so specified), and that in the case of creepers they are trained to a larch pole.

"Early in the spring I wrote a short note for 'Irish Gardening' on the effects of the winter's cold, especially with reference to the recent Chinese introductions, making, on the whole, a fairly cheerful report; that highly experienced and very good friend of mine, Sir FREDERICK MOORE of Glasnevin, warned me after reading it that I should probably prove to have been far too optimistic and that some disagreeable surprises were in store for me. I am happy to say that so far as Aldenham is concerned this warning has not been needed, and a close summer inspection brings the opposite result that in *no* case have I lost plants which I thought safe, and in several cases

shrubs as to which I had abandoned hope have broken into growth: *Olearia macrodonta* and *Raphiolepis Delacouri* both illustrate the truth of this. Indeed, I can name only one plant in this garden which shows greater injury in July than it did in March, and that is *Berberis Knightii*. However, as to this, I can only speak for Aldenham, for my friend Mr. SOAMES, who owns a lovely garden at Sheffield Park near Uckfield in Sussex, showed me about a fortnight ago several instances of plants badly hurt which up till a few weeks back appeared to have escaped.

"I remember Mr. WILSON, the well-known collector, telling me, when he was looking at his Chinese plants which I had raised from seed, that he had been at great pains to collect them from as high altitudes as possible, and his efforts in this direction are now proved to have been well rewarded. Nothing has impressed me more than the high average of hardiness among WILSON's introductions: all his *Berberis*, except *B. levis*, nearly all his *Cotoneasters*, and a great many of his *Viburnums*, *Stranvaesia undulata*, *Ilex Pernyi*, and many more, will be found in the list of uninjured. When one looks at the wreck of a great plant of the common *Berberis Darwinii*, and at the ordinary hollies, yews, and Portugal laurels showing various degrees of injury, it is very cheering to one like myself who has grown and distributed so many species whose presence in England is due to WILSON's energy and enterprise.

"I had intended to have included a report on plants at Aldenham, which have the protection of a wall, but a long illness prevented this being done; however, as I have but small wall space at Aldenham, a list of such plants would have been in no sense exhaustive, and must consequently have been very inferior in value and utility to that of plants grown in the open.

"A tree which last winter has shown to be entirely hardy deserves to be much more often planted than is the case at present. I mean *Plagianthus Lyalli*; those who know its delicate white flowers will, I feel sure, agree with me.

"In conclusion I would add that all my *Gunneras*, *scabra*, *chilensis* and its rarer form with dull red flowers introduced by Mr. ELWES, all suffered with like severity, the principal crowns being killed, though they were heavily protected with bracken and spruce boughs.

"In the case of some genera, such as *Deutzia*, *Diervilla*, *Spiraea*, and *Philadelphus*, I have not specified the different species which would run into great numbers, the collection being pretty complete, because, except for *Deutzia scabra*, *D. discolor*, and *Spiraea bullata*, which are slightly hurt, the whole of them appear to be immune to any cold, at any rate above zero.

"Of course it is not easy in every case to distinguish between injuries caused by cold and some other cause, but I have taken great pains to satisfy myself on the point before making this report, and in most cases have been able to examine several specimens of the same plant in different positions, for last winter, where so much of the

damage was caused by wind, protection from, or exposure to, the east made all the difference between severe injury or none, e.g. a tall plant of *Rhamnus Alaternus variegata* west of Aldenham House is barely touched, and a smaller one to the east of the building has lost many boughs and twigs.

"In the case of some of my rarest plants, such as *Aesculus Wilsoni*, *Emmenopterys Henryi*, &c., I am unable to report how they stood the winter, for, having only one specimen and knowing that if lost they could hardly be replaced, I kept them in large pots, and they passed the cold weather securely located in a shed.

"My first idea was to publish this article and the accompanying lists as a separate account of the effects of the winter of 1916-17 on tree and shrub life, but learning that my friend Mr. AUGUSTUS BOWLES was engaged in the heavy task of arranging and collating reports from numerous sources throughout the British Isles, I have thought it better to hand over my material to him, that he may incorporate it or make such use of it as he shall think best."

VICARY GIBBS.

GENERAL NOTE ON WEATHER OF WINTER 1916-17.

Mr. R. H. CURTIS has very kindly drawn up the following note regarding the weather of the winter of 1916-17.

"When it is desired to compare the effects of abnormal weather upon vegetation in a particular season, with those observed in corresponding seasons of former years, it is seldom safe to rely to any great extent upon one's personal impressions or recollections concerning what had occurred months, or it might even be years, before. Even when such recollections can be reinforced by memoranda made at the time, unless the memoranda are very full and complete there is still danger of a wrong judgment, owing to the fact that more than one factor capable of influencing the result has to be given its due weight; and of these factors a very important one is the condition of plant-life, as affecting its sensitiveness to injury, at the time when the abnormal weather occurred; and in addition there always remains the unfortunate—but unquestionable—fact that with the lapse of time some impressions are apt to deepen, and to acquire an undue importance in one's retrospect; whilst with others the reverse may be the case.

"It is especially desirable to bear these considerations in mind in the present case, because so many of the *data* available appear to be based entirely upon personal recollection; and an endeavour has been made to supplement and support them whenever possible by additional instrumental evidence as to the character of the weather conditions.

"For the purpose of the inquiry a Schedule of fourteen questions was sent out, asking for information as to the climatological

conditions of the period under review (the winter 1916-17) and also for details as to the damage done to plants by the frost.

"As regards the instrumental side of the data asked for, the result is not entirely satisfactory, either as regards quantity or quality. As regards the first point, they very inadequately represent the climate of the British Isles during the period. Their distribution was as follows: from Scotland, Ireland and North Wales *two* schedules were received from each; from Cumberland, Northumberland, Yorks, Cheshire, and Derby *one* from each; and from South Wales, and fourteen counties in the south of England, of which Suffolk is the most northern, a total of *forty-four*.

"Besides being scanty, the instrumental data also revealed the existence of a great diversity of method, or perhaps a great want of method of any sort, in setting up the instruments, and in observing and recording their indications. In a few cases screens had been employed for the thermometers, and the information supplied was evidently based on observations carefully and regularly made and recorded; in others a casual note revealed that the thermometers had been hung on a post, or affixed to a wall, without protection from sun or rain (?), and at heights of from one foot to five feet above the ground; and whilst there was no evidence of regularity and method in reading them, there were not wanting indications that in the absence of proper records the memory alone had often been relied upon for answers to the questions asked in the schedules, both as to the season under discussion and also those previous seasons with which they were being compared.

"It was evident therefore that the climatological data contained in the schedules were alone inadequate for the purpose in view, and it became necessary to combine with them information derived from other sources in order to arrive at a just conception of the character of the weather during the winter of 1916-17, the period under review, and wherever possible this has been done.

"It may be permissible here to remark, with reference to this lack of reliable data, that it emphasizes the need of having in every important garden a simple set of climatological instruments, which should show the temperature and hygrometrical condition of the air (a *dry* and a *wet* bulb thermometer), and the amount of rainfall, and if a record of the duration of sunshine could be added so much the better.*

"A thermometer is an unemotional instrument that, provided it be properly made, properly set up and screened from sun and rain and regularly read, can be relied upon to give unbiassed answers to the following three questions, asked in the 'Schedule of Queries' upon which the present inquiry is based: (1) What were the lowest temperatures recorded during the winter? (2) How do they compare

* With the exception of the Sunshine Recorder these instruments need not be expensive but little. It is possible to purchase thermometers quite good enough for the purpose suggested for one shilling each.

with those experienced during other winters? (3) How long did the frosts last?

"The rain-gauge, which also need not be expensive to ensure accuracy, will give information as to the relative dryness of the soil, and inferentially, in conjunction with the temperature, information respecting the probable condition of plant-life—its ripeness, amount of sap, &c.—factors which are of importance when the continued effect of abnormal temperature is being considered.

"But before dealing in detail with the weather of the winter as described in the schedules it is desirable to take a brief retrospect of that of the preceding summer. This was by no means an exceptionally warm season; indeed the early part of it was decidedly cool, and vegetation was retarded in consequence; but by the middle of July the temperature had become normal again, and August was throughout warmer than the average, and was followed by decidedly mild weather which continued till near the close of November. This unusual warmth will probably account for the remarks made on several of the schedules respecting unusual 'sappyness,' and continued growth of many plants until quite late in the year, and right up to the time when it was abruptly checked by the advent of severe frost. This point is emphasized in many of the schedules; as is also another, to which some gardeners appear to attach even more importance, namely the effect of the strong, keen winds by which in many districts the frosts were accompanied. One note speaks of wind as 'our chief enemy'; another says that 'with the bitter winds . . . the frost was more destructive than when the thermometer gave even lower readings' in calm weather; and yet another has it that 'but for the wind we could laugh at frost!'

"The *duration* of the frost, the third question to which a definite answer was asked for, and a point of importance, elicited replies which were in some cases mutually contradictory, again owing, as we think, to the absence of a written record. In three returns from one county, whose topographical features are fairly uniform from end to end, and over which the climatic conditions could have varied but little, the frost is said to have lasted (1) 'practically the winter through'; (2) 'from the beginning of January to the middle of February,' say six weeks; and (3) 'from a fortnight to three weeks'; a variation of estimate which well illustrates the risk run in trusting to the unaided memory. But generally speaking the replies to this question given in the schedules are too vague to be of much use.

"Coming now to deal with the general results of this inquiry as to the severity of the winter 1916-17, as revealed by all the evidence available, we may say that the last three months of 1916 formed a fitting close to a year which had, on the whole, been dull and wet, and more or less stormy, throughout—a typically unfavourable year for the horticulturist! Storminess was the outstanding feature of October; but with the strong south-west winds which prevailed the temperature kept rather above the average right through the month,

and on to near the close of November, when there came a change of wind to north, and with it a spell of cold which soon developed so much intensity and also in the area covered, that before long low night temperatures of between 10° and 20° Fahr. were being experienced in most parts of the British Isles. At the very end of the year there came a brief interval of south-westerly winds and with them a general increase of temperature, the thermometer rising in the early days of January to an exceptionally high point for the season; but vegetation was then in a very backward state, and at Wisley it was estimated to be quite a month later than in normal years.

"The milder weather with which the New Year began did not, however, continue very long. The wind soon got back again into a northern quadrant, and severe frosts presently became once more general, the thermometer falling as low in some parts of Ireland and England as in the north of Scotland. At Wisley on the 30th a temperature of 7° Fahr. was recorded on the grass, and a week later when this renewed spell of cold had attained its culmination it fell still lower to -4° on the grass. But all over the kingdom it was phenomenally low in these early days of February, and grass temperature readings near zero Fahr. were recorded in Surrey, Kent, Worcestershire, Radnor, Lancashire, as well as at places further north across the Border. At Wisley there had been up to this period thirty-seven consecutive days of frost; at Gatton Park their duration was six weeks; Sherborne Dorset, thirty-four days; Tortworth, Glos., thirty-five days; Monmouth, thirty-two days; and even at St. Keverne (on the Cornish coast just west of Falmouth) 'there was a grass frost every night from January 14 to February 14.'

"For a similarly cold spell one must go back for at least twenty-two years to 1895, which year is named in most of the schedules as the most recent for comparison with 1917, and is confirmed as such by a reference to official instrumental records. The intensity of the frost in that year was perhaps even greater than in the more recent year with which we are now dealing, but not its duration, and probably the area over which it was felt was less extensive. It is a fact of some importance to note that the total amount of precipitation, either as rain or, and more especially, as snow, during this cold spell was less than the average, and as a result the protection which might have been afforded to vegetation by snow was largely wanting.

"Towards the close of February temperature had again become nearly normal all over the kingdom, but the usual seasonal increase of warmth looked for in March did not occur, and, instead, frosts again became of frequent occurrence, and were at times very severe, the worst occurring in the second week, when the thermometer fell in several districts to below 10° Fahr. in the screen, and at Wisley to 9° Fahr. upon the grass. Again this extreme cold occurred concurrently with a strong north-easterly wind, which locally did great damage in gardens, even to hardy things. At Wisley it was noted that whilst all vegetables suffered very much, 'many kinds looked

as though they had been scorched by fire'; and also that 'much injury was done to trees and shrubs.' At the close of the month (March) 'all vegetation had become extraordinarily late, and with the exception of a few Crocuses scarcely any spring flowers were to be seen, whilst all garden operations had become much delayed by the unseasonable weather'; and this note expresses the general tenor of the remarks in the schedules. In some districts gorse was killed; trees and shrubs were reported to have suffered to a greater extent than with any previous frost, of which a record had been kept; birds, especially thrushes, were killed in large numbers; and at Byfleet (Surrey) 'Globe Artichokes and clipped box were killed outright.' On the other hand, in the Royal Gardens at Kew, whilst 'many hardy plants, like gorse and Arbutus, were badly cut on the north-east side, they were untouched where screened from the wind.' There were other observers who attributed the damage wrought largely to the occurrence of the mild interval between the spells of severe cold, as well as to the effect of the wind; and many remarks lay stress on the prolonged duration of the frost as the chief cause of the damage done.

"It remains to be said that the wintry weather continued well on into April. It therefore covered the exceptionally long period of nearly five months, during the whole of which, with a few brief intervals, it was generally cold, and often extremely so, and very boisterous and disturbed with keen, biting winds.

"In April the temperature over some parts of Scotland again fell to below 10° Fahr., and in all other parts of the kingdom to the neighbourhood of 20° Fahr.—generally a little below that point, and nowhere much above it; and there appears good reason for the verdict that all over the kingdom it was the coldest April on record. Quite in the south of England, at Isleworth, it was described as 'the coldest April for twenty-seven years, and to have had the heaviest snowfall for that month in thirty-four years.' At Totland Bay, Isle of Wight, it was the 'lowest April mean temperature for thirty-one years,' &c. At the beginning of the month at quite a number of places, in Ireland as well as in England and Scotland, the thermometer did not rise to 30° Fahr. at the warmest part of the day; and frosts, more or less severe, occurred every night. But before the close of the month conditions had become greatly improved, and at the commencement of the fourth week maximum temperatures of 60° and upwards were again generally recorded all over the kingdom, and once more climatic conditions had become normal."

* * * * *

The following is a list of the localities from which reports and lists were received, with some particulars concerning their situation and, where available, the minimum temperature recorded.

The portion of each address given in small capitals is the form in which reference is made to that locality in the general list of plants.

| Locality. | Height above Sea. | Situation with regard to Shelter, &c. | Lowest Temperature. | | Records made by |
|---|----------------------|---|-------------------------------|--------------|-------------------------------|
| | | | In Screen. | On Grass. | |
| ABBOTSBURY Castle, Dorset | Feet. 100 | Sheltered by hills and trees, half mile from sea | 16 | 14 | Mr. H. Kempshall. |
| ALDENHAM House, Elstree, Herts | 305 | Sheltered by hills | 3 | | The Hon. Vicary Gibbs. |
| ALDERSEY Hall, Cheshire | 50 | Hills on east | 12 | | Hugh Aldersey, Esq. |
| ALNWICK Castle, Northumberland | 181 | | 8 | | Mr. W. Thomson. |
| ASHFORD, Eastwell Park, Kent | | | | | Mr. J. E. Weston. |
| ATLESHURY, Waddesdon, Bucks. | 650 | Open | 2 | 0 | Mr. G. F. Johnson. |
| BEACONSFIELD, Butlers Court, Bucks. | 350 | Sheltered by woods | | | Mrs. Reclitt. |
| BETWYS Y COED, Coed Derw, N. Wales. | 100-150 | | | | E. C. Buxton, Esq. |
| EAST BERGHOLT, Suffolk | 129 | Sea on three sides | 16.5 | 3 | Charles Eley, Esq. |
| BOSAHAN, St. Martin, Cornwall | 250 | | 26 | 23 | Sir Arthur P. Vivian, Bart. |
| EAST BURNHAM Park, Slough, Bucks. | 120 | | | | Sir Harry J. Veitch. |
| BYFLEET, West Hall, Surrey | 62 | Sea within two miles | (-1) | 8 | Mr. G. Carpenter. |
| CARNARVON, Glynlivon Park, Llanwrda, N. Wales | 200 | | 10 | | Mr. Peter Williams. |
| CHATSWORTH, Derbyshire | 436 | Sheltered by hills | .01 | | Mr. F. Jennings. |
| CHIPPING NORTON, Sarsden, Oxon. | 530 | Sheltered by trees | 5 | | Mr. J. E. Vine. |
| COBHAM Hall, Cobham, Kent | 300 | | (-1 Jan. 5 April 2) | | Earl of Darley. |
| COLESDORNE, Cheltenham, Glos. | 550 | Sheltered by woods | | | H. J. Elwes, Esq. |
| CRAWLEY, Tilgate Forest Lodge, Sussex | 440 | Sheltered by trees | | 0 | Major C. G. A. Nix. |
| CROWSLEY Park, near Henley-on-Thames, Oxon. | 200 | | (ze to frost every winter) | | Col. Baskerville. |
| DAWYCK, Scotland | 750-800 | | -2 | | F. R. S. Balfour, Esq. |
| DORKING, Burford Lodge, Surrey | 150 | Sheltered by trees | | 9 | Sir William Lawrence, Bart. |
| DOWNHAM, Roston Lodge, Suffolk | 35 | Pennine Range six miles to east | | | R. K. Pratt, Esq. |
| EDWARDS, Rye, Sussex | 380 | | 0 | | Charles H. Shaw, Esq. |
| FERNSIDE, Mabledon House, Northants | 110 | | | | E. A. Bowles, Esq. |
| FRITTON, Collyer Hall, Essex | 900 | | 1.7 | | Mr. Arthur Bullock. |
| LESTREE, Kilton, Devon | 700 | | 1.0 | 6 | Sir Thomas Dyke Acland, Bart. |

| Locality. | Height above Sea. | Situation with regard to Shelter, &c. | Lowest Temperature. | | Records made by |
|---|---|--|------------------------|--------------|--|
| | | | In Sueen. | On Grass. | |
| ROSTREYOR House, Rostrevor, Ireland | Feet. sea level to 350. mostly 150 | Sheltered by hills and plantations on Carlingford Lough | 19 Ap. 10 | | Sir John Ross of Bladensburg, K.C.B. |
| SHERBORNE Castle, Dorset | 195 | Open | 20 | | Mr. J. Turton. |
| SLOUGH, Royal Nurseries, Bucks | 100 | Hills and woods | 1 1/2 | | Arthur Turner, Esq. |
| SOUTH MOLTON, Castle Hill, North Devon | 317 | Rather open | 11 | | Mr. E. E. Blistow. |
| STREVENAGE, Weston Park, Herts | 450-470 | Sheltered by hills and woods | 10 | | M. R. Pryor, Esq. |
| STOW-on-the-Wold, Abbotswood, Glos. | 550 | Sheltered by hills to east, 8 miles from sea | 3 | | Mark Fenwick, Esq. |
| TALY-CAPN, Bodnant, N. Wales | 150 | On sea | 9 | | Hon. Harry McLaren. |
| TORTWORTH, Falfeld, Glos. | 264 | On sea | 10 | | Mr. John Banting. |
| TREBAH, Falmouth, Cornwall | 300 | On sea | 18 | | Mrs. Charles Hext. |
| UCKFIELD, Sheffield Park, Sussex | 120 | Open | 10 | | Arthur G. Soanes, Esq. |
| WAKEHURST Place, Ardingly, Sussex | 350-400 | Open | 17 | 7 | Gerald W. E. Loder, Esq. |
| WESTONBURT, Tetbury, Glos. | 400 | On North Sea | 8 | | Mr. A. Chapman. |
| WHITBY, Mulgrave Castle, Yorks | 410 | River Deben, salt water estuary within half mile | 7 Ap. 1 | | Mr. Joseph Corbett. |
| WISLEY, R.H.S. Gardens, Ripley, Surrey | 90-150 | | 5 | | Mr. S. I. Wright. |
| WOODBIDGE, The Nursery, Suffolk | 39 3 | | 11 | -4 | R. C. Notcutt, Esq. |
| WYE includes { Oantigh House Oxendon House Agricultural College (Eastwell) | 200 | | | | Mr. Bond. Cecil H. Hooper, Esq. H. C. Chapelow, Esq. |

LIST OF PLANTS.

In arranging the names of plants for the following list, I have followed the Kew Hand Lists in any cases of divergence or doubt that have attracted my attention. I cannot, of course, take any responsibility for the correctness of the names as applied to the plants, having merely copied them from the lists. In a few instances I have taken the liberty of altering names when I believe the name generally in use in gardens is not the correct one. For instance, *Berberis Wallichiana* becomes *B. Hookeri*, as the true *B. Wallichiana* is probably not in cultivation. *Crinodendron Hookeri* becomes *Tricuspidaria lanceolata*, and so on.

SIGNS AND ABBREVIATIONS.

* Before a name signifies that the plant is of recent introduction, and, unless otherwise stated, in almost all cases from China.

† Following the name of the locality shows that the plant was grown against, or close to, a wall. If any of the letters N., S., E., or W. are added, a wall facing North, South, West, &c. is signified.

When a numeral follows the name of the locality it shows the number of years the plant has been in its present position.

The extent of damage, or escape from injury, is shown by the use of the initial letters of the following words in italics:

K = Killed.

G = Cut down to the *Ground* level.

B = Badly injured.

S = Slightly injured.

U = Uninjured.

The names of localities have been shortened when possible to one word. An alphabetical list of these will be found in the table on pp. 402-404, with full addresses and information as to exposure, amount of frost, &c.

Abelia chinensis. B. Aldenham.

A. floribunda. K. Hever 5; B. Glasnevin; S. Exeter 14, Monreith† 12, Trebah 12, Wakehurst† 10.

A. rupestris. K. Oxon; B. Chipping Norton 6, Wisley; S. Enfield 10; U. Wakehurst.

A. spathulata. U. Leonardslee 6.

A. triflora. U. Aldenham.

**Abies*. All new Chinese, uninjured at Kew 6.

Abies bracteata. K. Dawyck (including one 10 ft. high).

**A. Delavayi*. U. Leonardslee.

**A. Faxoniana*. U. Leonardslee.

A. firma. K. Dawyck.

A. Pindrow. U. Dawyck.

A. Pinsapo. Monmouth (many needles killed).

A. recurvata. U. Leonardslee.

A. religiosa. G. Glasnevin; U. Wakehurst 2.

A. sachalinensis. U. Dawyck.

A. sibirica. U. Dawyck.

Abutilon megapotamicum. K. Monreith†, Nymans† 7; G. Monreith†; B. Wakehurst†; U. Monreith.

- Abutilon vitifolium*. K. Crawley 7, Stow† 2, Wisley 8; B. Glasnevin, Mangotsfield 1, Nymans 4; S. Enfield 6, Wisley 6, Leonardslee 3, Wakehurst.
- Acacia alata*. K. Rostrevor.
- A. armata*. K. Abbotsbury 5; S. Rostrevor.
- A. Baileyana*. K. Abbotsbury 5, Ashford, Nymans† 2, Tal-y-Cafn† 2; B. Rostrevor; S. Trebah 12.
- A. calamifolia*. K. Headfort, Rostrevor.
- A. cultriformis*. B. Lanarth 7.
- A. cyanophylla*. K. Abbotsbury 2.
- A. Cyclops*. K. Rostrevor.
- A. dealbata*. K. Aldenham, Nymans† 7; G. Exeter 4, Tal-y-Cafn 8, B. Enfield, 8; S. Lanarth 10; U. Fota, Rostrevor.
- A. decurrens*. U. Rostrevor.
- A. Dietrichiana*. K. Headfort.
- A. eburnea*. K. Rostrevor.
- A. juniperina*. B. Lanarth 6.
- A. longifolia*. K. Exeter 14, Headfort, Rostrevor.
- A. melanoxylon*. U. Rostrevor, Wakehurst† 5.
- A. neriifolia*. B. Rostrevor.
- A. pulchella*. K. Rostrevor†.
- A. pycnantha*. K. Abbotsbury 2, Rostrevor.
- A. Riceana*. S. Exeter†.
- A. verticillata*. K. Headfort, Rostrevor; B. Lanarth 6, Rostrevor.
- A. Whanii*. K. Headfort.
- Acantholimon venustum*. K. Monreith 6, Stow.
- Acanthopanax divaricatum*. U. Aldenham.
- A. lasiogyne*. U. Aldenham.
- A. sessiliflorum*. U. Aldenham, Enfield 10.
- A. 2480* Vilmorin. U. Aldenham.
- Acer akurundinense*. U. Aldenham.
- A. Campbelli*. U. Westonbirt.
- A. capillipes*. K. Bergholt; S. Aldenham.
- A. cappadocicum*. S. Aldenham.
- A. catalpifolium*. S. Glasnevin.
- A. circinatum*. U. Aldenham.
- A. crataegifolium*. U. Aldenham.
- A. creticum*. U. Aldenham.
- A. dasycarpum*. U. Aldenham.
- A. Davidi*. K. Dawyck; U. Aldenham, Enfield 1, Slough, Wakehurst 6.
- A. diabolicum*. U. Aldenham.
- A. discolor*. K. and B. Aldenham.
- A. erianthum*. U. Aldenham, Tortworth, Westonbirt.
- A. Forrestii*. G. Wisley, 2.
- A. fulvescens*. U. Aldenham.
- A. griseum*. U. Aldenham, Westonbirt.
- A. Heldreichii*. U. Aldenham.

- Acer Henryi*. K. Dawyck; S. Hargham, Aldenham; U. Westonbirt.
A. Hookeri. B. Rostrevor † N.
A. japonicum. U. Aldenham.
A. lobatum. U. Hargham.
A. Lobelii. U. Aldenham.
A. longipes. S. Glasnevin.
A. Maximowiczii. U. Aldenham, Westonbirt.
A. Miyabei. U. Aldenham, Westonbirt.
A. nikoense. S. Aldenham.
A. oblongum. S. Aldenham.
A. opulifolium. U. Aldenham.
A. pennsylvanicum. U. Aldenham.
A. pictum. U. Aldenham.
A. pictum var. *Mona*. U. Hargham 7.
A. platanoides var. *Schwedleri*. U. Aldenham.
A. rubrum. U. Aldenham.
A. saccharinum. U. Aldenham.
A. sinense. S. Glasnevin.
A. 4100 Forrest. S. Aldenham.
A. 6008 Forrest. K. Aldenham.
Achania mollis. K. Abbotsbury 2.
Achillea Kellereri. K. Enfield 1, Wisley.
A. Obvestii. K. Wisley.
Actinidia chinensis. U. Aldenham.
A. venosa. U. Aldenham.
Ailanthus anagyris. K. Enfield 7, Llandaff 2.
A. decorticans. U. Enfield.
A. frankenioides. U. Rostrevor.
A. foliolosus. K. Glasnevin.
A. sepiaria. U. Aldenham, Aldersey, Enfield, Fota, Nymans 9.
A. x Citrange. U. Fota.
A. x Colman.
A. x Morton.
A. x Savage. } S. Enfield.
Aesculus arguta. S. and U. Aldenham.
A. californica. K. Dawyck; W. Aldenham, Enfield 10.
A. chinensis. U. Kew.
A. coriacea. U. Aldenham.
A. discolor mollis. U. Aldenham.
A. flava. U. Aldenham.
A. glabra. U. Aldenham.
A. indica. B. Dawyck; U. Aldenham, Mangotsfield.
A. parviflora. G. Aldersey; U. Aldenham.
A. Wilsonii. U. Kew.
Azopanthus Mooreanus. U. Aldersey, Enfield, Isleworth, Wake-
 hurst.
A. umbellatus. K. and B. Isleworth, Lanarth 10; U. Wake-
 hurst 7.

- Agapanthus Weillighii*. K. and B. Isleworth.
Agave americana. K. Enfield 4, Grinstead 4; B. Nymans 4.
A. × Franzosinii. U. Rostrevor.
A. Parryi. Enfield, U. covered 12; S. open 12.
A. Salmiana. U. Rostrevor.
Agonis flexuosa.
A. marginata. } K. Ludgvan.
A. parviceps. }
Ailanthus glandulosa. U. Aldenham, K. Dawyck.
A. Duclouxii. S. Aldenham.
A. Giraldii. S. Glasnevin.
A. Vilmoriniana. K. Aldenham (young plants); B. Aldenham 10;
S. Glasnevin.
**Alnus cremastogyne*. U. Aldenham, Kew 9, Wakehurst 7.
A. firma. U. Aldenham.
**A. lanata*. U. Kew 9, Aldenham.
A. nitida. U. Aldenham.
A. sitchensis. U. Aldenham.
Aloysia citriodora. K. Ashford, Exeter† 17, Slough 1, Wakehurst
10; G. Colesborne†, Enfield 15, Fota (old plants).
Amarylhis Parkeri. K. Isleworth (bulbs exposed); S. Enfield; U.
Isleworth (well covered).
Amelanchier oblongifolia.
A. oxyodon. } U. Aldenham.
A. pumila. }
Amicia Zygoteris. K. Nymans 3, Wakehurst†.
Ammocharis falcata. U. Isleworth (kept dry).
Amorpha canescens. B. Aldersey 11; U. Aldenham.
A. caroliniana. B. Aldenham.
A. fruticosa. B. Aldersey 11.
A. montana. } S. Aldenham.
A. nana. }
A. sinensis. U. and S. Aldenham.
**Amphicome arguta*. K. Colesborne, Himalayan var.; K. Enfield,
Farrer's var.; U. Colesborne, Farrer's var.
Anchusa italica. K. Hever 1.
Andromeda Polifolia. S. Nymans 3; U. Wakehurst 10.
**Anemone rupicola*. K. Stow (? frost); U. Enfield.
Anopterus glandulosus. K. Abbotsbury 5; U. Ludgvan, Rostrevor.
Anthyllis Barba-Jovis. K., B., and U. Rostrevor; B. Headfort.
Wakehurst† old.
A. Hermanniae. K. Enfield 6, Kew 15 (except under walls); B.
Glasnevin.
Apera arundinacea. K. Grinstead.
Aphyllanthes monspeliensis. K. Harrow except one plant 4-6;
B. Enfield 15; S. Tal-y-Cafn 2 and 5.
Aplopappus ericoides. K. Nymans 2.

- Aralia chinensis*.
A. chinensis var. *glabrescens*. } U. Aldenham.
A. Maximowiczii. S. Grinstead.
A. pentaphylla. U. Aldenham.
Araucaria excelsa. K. Abbotsbury 2.
Araujia sericifera (syn. *Physianthus albens*). K. Rostrevor†.
Arbutus Andrachne. K. and S. Wakehurst 7; G. Westonbirt 28;
 B. Stow 4, Wye; S. Lyndhurst 12.
A. canariensis. B. Glasnevin; U. Rostrevor.
A. Croomii. B. Wakehurst.
A. diversifolia. K. Glasnevin.
A. espinosa. U. Rostrevor.
A. furiens. K. Rostrevor, Wakehurst 3.
A. hybrida. G. Colesborne, Westonbirt 38, Kew 30; G. and B.
 branches on N.E. side; K. and B. Aldenham.
A. Menziesii. K. Lanarth 2, Stow 1; B. Aldenham, Lanarth,
 Wakehurst, Wisley 17, Wye; S. Uckfield 5; U. Mangotsfield 1.
A. Rollisonii. S. Glasnevin.
A. Unedo. G. Colesborne; S. Molton 6; B. Aldenham, Glasnevin,
 Wye; S. Aldenham, Alderscy 10, Chipping Norton 6, Leonards-
 lee 40 (injured in 1908), Slough 4, Newbury.
A. Unedo var. *× magnifica*. S. Glasnevin.
Arctostaphylos glauca. K. Dawyck, Uckfield 2.
A. heterophylla. K. Dawyck.
A. Manzanita. K. Uckfield 2.
A. pungens. K. Dawyck (including old plants).
A. Stanfordiana. K. Leonardslee 4.
**Arisaema concinnum*. }
A. consanguineum. } U. Colesborne planted deeply in shade.
A. curvatum. }
Aristolochia altissima. S. Rostrevor.
A. heterophylla. U. Aldenham.
A. pubescens. S. Aldenham.
A. Siphon. U. Aldenham.
Aristotelia Macqui. K. Aldenham (young plants), Tortworth 2;
 B. Aldenham (old plants), Glasnevin; S. Crowsley.
A. racemosa. K. Aldenham, Fota 15; B. Ludgvan; U. Wake-
 hurst 4.
A. tomentosa. B. Leonardslee 5.
Artemisia camphorata. K. Aldenham.
A. tridentata. B. Aldenham; U. Enfield.
Arundinaria anceps. G. Kew 20; B. Aldenham, Bettws; S.
 Enfield, Slough 5; U. Woodbridge 6.
A. auricoma. U. Aldenham, Enfield.
A. falcata. B. Wakehurst.
A. Falconeri. B. Wakehurst.
A. Hindsii. U. Aldenham.
A. Hookeriana. G. Fota 10-12.

- Arundinaria japonica* (Metake). G. Northwich; B. Colesborne; S. Aldenham, Aylesbury 40, Enfield 20, Slough 2.
- A. macrophylla*. K. Abbotsbury 1.
- A. nitida*. G. Oxon; U. Aldenham, Enfield 15, Wisley, Wood-bridge.
- A. Simoni*. G. Aylesbury 10.
- A. spathiflora*. B. Rostrevor.
- Arundo conspicua*. K. Aylesbury 30, Grinstead, Wisley; S. Enfield.
- Asimina triloba*. U. Aldenham.
- Astelia Banksii*. B. Rostrevor.
- **A. nervosa*. U. Monreith.
- Artemisia argentea*. K. Grinstead.
- Astragalus Tragacantha*. K. Aldenham.
- Astroloma pinifolium*. K. Rostrevor.
- Athrotaxis cupressoides*. } U. Aldenham.
- A. laxifolia*. }
- Atraphaxis lanceolata*. K. Aldenham.
- Atriplex canescens*. U. Aldenham.
- A. Halimus*. K. Enfield, Slough 2; B. Enfield, Glasnevin; S. Hayling Island, 8.
- Azalea amoena* var. *Hinodigira*. K. Slough 5.
- A. indica*. K. Grinstead, U. Wisley.
- Azara crassifolia*. G. Abbotsbury; B. Leonardslee 4.
- A. dentata*. B. Glasnevin, Wisley 8.
- A. Gilliesii*. K. Uckfield 3.
- A. integrifolia*. K. Aldenham, Young; B. Carnarvon 12.
- A. microphylla*. K. Bergholt 2, Byfleet†; G. Westonbirt 25, Wisley 7-15; B. Aldenham, Glasnevin, Romford 15, Uckfield; S. Chipping Norton 20, Hever 7, Harrow† 4, Leonardslee (B. 1908), Monmouth† W. 26, Stow, Uckfield 7; U. Aldersey† 12.
- Azolla caroliniana*. K. Aldersey 6.
- Baccharis halimifolia*. K. Hayling Island 8; U. Aldenham.
- B. patagonica*. K. Hayling Island 5, Wisley 12; B. Glasnevin; S. Hayling Island; U. Aldenham.
- Baillonia juncea*. S. Wakehurst; U. Aldenham, Enfield 15.
- Bamboos. B. Abbotsbury (recovering); G. and B. Wisley (all except *Arundinaria nitida*).
- Bambusa agrestis*. S. Aldenham.
- Banksia coccinea*. } K. Ludgvan.
- B. grandis*. }
- B. integrifolia*. K. Abbotsbury, Rostrevor (also B.).
- B. littoralis*. B. Rostrevor.
- B. marginata*. K. Rostrevor.
- B. paludosa*. B. Leonardslee† 10.
- B. quercifolia*. K. Abbotsbury 9.
- B. spinulosa*. K. Rostrevor.

- Beaucarnea longifolia*. S. Lanarth.
Berberidopsis corallina. K. Abbotsbury 4, Stow† 5; B. Edenhall† 10, Mangotsfield 3; U. Bosahan, Wakehurst†.
Berberis acanthifolia. U. Enfield 2.
**B. actinacantha*. S. Aldenham, some U.; U. Westonbirt.
B. acuminata. U. Aldenham, Westonbirt.
**B. aggregata*. U. Aldenham, Leonardslee, Westonbirt.
B. × alksuthiensis. K., G., and B. Aldenham.
B. Aquifolium. G. Aylesbury 25; B. Enfield, Oxon; S. Aldenham.
B. Aquifolium var. *undulata*. B. Slough 10.
**B. arguta*. K. Rostrevor.
**B. atrocarpa (levis)*. S. Aldenham, Kew 10. B. Aldenham, Glasnevin.
B. Bealei. U. Aldenham.
B. brachypoda. U. Aldenham.
**B. brevipaniculata*. U. Aldenham, Westonbirt.
B. buxifolia (dulcis). S. Aldenham.
B. buxifolia nana. B. Aldenham.
B. canadensis. U. Aldenham.
B. candidula. U. Aldenham, Leonardslee 3, Westonbirt.
**B. Chinese*. U. All at Crawley, all except *atrocarpa* at Kew.
B. Chitria. U. Aldenham.
**B. concinna*. S. Aldenham; U. Westonbirt.
B. congestiflora. B. Crawley; S. Aldenham.
B. Darwinii. K. Aylesbury (also B.) 30; G. Colesborne (also B.), Oxon, Slough 2, Wye; B. Aldenham, Crowsley, Edenhall 10, Enfield, Harrow, Lanarth (exposed to E.), Romford 15, Stow 10, Uckfield (also S.) 7, Tortworth 20, S. Chipping Norton 15; U. Aldersey.
B. diaphana. U. Aldenham, Westonbirt.
**B. dictyophylla*. U. Aldenham, Wakehurst 3, Westonbirt.
B. empetrifolia. U. Aldenham, Westonbirt.
B. Fendleri. U. Aldenham.
B. Fortunei. B. Aldenham.
B. Fremontii. K. Nymans; S. Aldenham, Wakehurst† (old); U. Mangotsfield 5, Rostrevor 7.
**B. Gagnepainii*. B. Colesborne; U. Aldenham, Mangotsfield 3, Slough, Westonbirt.
B. heteropoda. U. Aldenham.
B. Hookeri (Wallichiana of Gardens). B. Aldenham, Lanarth 4 Oxon, Wisley 10; U. Slough.
B. ilicifolia.
B. integerrima. } U. Aldenham.
B. Jamesonii. U. Westonbirt.
B. japonica. G. Westonbirt 25; W. Aldenham, Wisley.
B. Julianae. U. Aldenham.
B. Knightii. B. Aldenham, Harrow, Oxon; S. Crowsley, Stow 10; U. Wakehurst 5, Westonbirt.

- *Berberis Koreana.* U. Westonbirt.
B. Maximowiczii. U. Aldenham.
B. Mouillacana. B. Aldenham.
B. nepalensis. B. Aldenham; S. Monreith 6.
B. nervosa. U. Aldenham, Westonbirt.
B. polyantha. U. Aldenham, Slough, Westonbirt.
B. Prattii. U. Aldenham.
B. pruinosa. B. Crawley 6; S. Crowsley, Wakehurst 5; U. Aldenham, Enfield 7.
B. Regeliana. U. Aldenham.
B. repens. U. Aldenham.
B. sanguinea. S. Aldenham; U. Westonbirt.
**B. Sargentiana.* B. Wakehurst 5; S. Glasnevin; U. Aldenham, Enfield 1, Mangotsfield.
B. serrata. } U. Aldenham.
B. sinensis. }
**B. Stapfiana.* U. Aldenham, Mangotsfield 2, Stow.
B. stenophylla diversifolia. } U. Aldenham, Westonbirt.
B. stenophylla Irvingii. }
B. subcaulialata. G. Colesborne; U. Aldenham, Mangotsfield, Westonbirt.
B. thibetica. }
B. Thunbergii. } U. Aldenham.
B. Thunbergii \times *vulgaris.* }
B. Tischleri. B. Aldenham.
B. trifoliata. K. Aldenham; S. Wakehurst† 5.
**B. verruculosa.* U. Aldenham, Enfield 1, Leonardslee 3, Slough 3, Wakehurst 5.
B. virescens. S. and U. Aldenham.
B. Wilsonae. S. Aldenham (others U.), Enfield 2-6; U. Aldenham, Leonardslee 3, Mangotsfield 2, Slough.
**B. 3394 Vilmorin.* S. Aldenham.
**B. 4039 Vilmorin.* U. Aldenham (but one plant B.).
**B. 7640 Vilmorin.* U. Aldenham.
Berchemia racemosa. U. Leonardslee 4.
Betula albosinensis. U. Aldenham.
B. alnoides. K. Dawyck; U. Aldenham.
B. corylifolia. }
B. dentata. } U. Aldenham.
B. Ermani. }
B. fontinalis. }
B. humilis. }
B. japonica var. *mandschurica.* U. Aldenham, Leonardslee 6.
B. kemaica. } U. Aldenham.
B. lenta. }
B. luminifera. K. Dawyck; U. Aldenham.
B. Medwediewi. U. Leonardslee 4.

- Betula occidentalis.*
B. papyrifera.
B. populifolia.
B. Potaninii.
B. pumila.
**B. Schmidtii.* U. Aldenham, Leonardslee 2.
B. utilis. U. Aldenham.
Bignonia capreolata. K. Abbotsbury 16.
B. radicans. See Tecoma.
Billardiera fruticosa. U. Rostrevor†.
B. longiflora. B. Poolewe; S. Wakehurst; U. Colesborne†, Rostrevor†.
Boeninghausenia albiflora. K. Monreith 6 (1 plant U.).
Bowkeria Gerrardiana (triphylla). K. Rostrevor; G. Nymans 5.
Brachyglottis repanda. K. Bosahan 5; B. Rostrevor.
Brachylaena dentata. K. Rostrevor.
Brachysema lanceolatum. K. Fota† 2.
Brahea Roezii. B. Fota 3.
Brodiaea volubilis. K. Monreith 1.
Broussonetia papyrifera dissecta. B. Aldenham, Wisley 4.
B. papyrifera cucullata. Less hardy than type, Aldenham.
Brunnichia cirrhosa. S. Wakehurst 2.
Buddleia albiflora. U. Aldenham; B. Wisley 6.
**B. alternifolia (Farrer 100);* U. Enfield 1 and 2, Wisley 1.
B. asiatica. K. Lanarth 6.
B. auriculata. K. Abbotsbury 9; B. Wakehurst 5.
B. Colvillei. B. Headfort; U. Mangotsfield 5, Nymans 3, Wakehurst.
B. globosa. G. Cobham 8, Hitchin 13, Kew; B. Aldenham, Cobham† 8; S. Enfield 7 and 10; U. Nymans 15.
B. japonica. B. Aldenham.
B. Lindleyana. K. Abbotsbury (also B.); B. Aldenham, Nymans 5.
B. variabilis. K. Aldenham (also B.), Exeter 17; G. Monmouth (exposed to E.); B. Oxon 3, Wisley 12; S. Aylesbury 10, Monmouth (exposed to W.); U. Aldersey, Cobham, Nymans.
B. variabilis magnifica. B. Wisley; U. Enfield, Slough.
B. variabilis superba. K. Slough 3.
B. variabilis Veitchii. B. Wisley; U. Cobham (K. 1908-9), Nymans, Slough.
B. variabilis Farrer 424. U. Wisley 1.
Bumelia lycioides. B. Leonardslee 4.
Bupleurum fruticosum. B. Aldenham.
Bursaria Pantonii. U. Rostrevor.
B. spinosa. S. Rostrevor.
Buxus balearica. U. Aldenham.
B. chinensis.
B. Harlandii.
B. japonica. } U. Aldenham.
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- Caesalpinia Gilliesii*. K. Abbotsbury 5.
C. japonica. G. Slough 3; S. Aldersey† 5, Lanarth 5, Nymans, Wakehurst 8.
C. tinctoria. K. Abbotsbury 3.
Calandrinia umbellata. K. Rostrevor.
Calceolaria alba. U. Rostrevor (one plant S.).
**C. angustifolia*. K. Grinstead.
C. integrifolia. K. Lanarth (also G.) 10; Glasnevin, Monreith (also G., B., and S.) 4, Rostrevor; G. Abbotsbury; B. Wakehurst 2; U. Rostrevor (some).
C. Sinclairii. K. Wakehurst†; B. Rostrevor.
C. violacea. K. Aldersey† (some G.), Lanarth 8 (some G.), Stow; G. Enfield 15, Monreith† 3, Wakehurst† 2; B. Rostrevor U. Bosahan.
Callicarpa japonica. G. Enfield; S. Glasnevin; U. Aldenham.
**C. 6894 Vilmorin*. K. Aldenham.
Callistemon coccineus. K. Headfort; S. Wakehurst† 3; U. Rostrevor.
C. lanceolatus. K. Headfort; G. Lanarth; U. Rostrevor.
C. rigidus. } U. Rostrevor.
C. rugulosus. }
C. salignus. B. Nymans 2; U. Rostrevor.
C. sanguineus. } U. Rostrevor.
C. Sieberi. }
C. speciosus. G. Lyndhurst.
Callitris cupressoides. K. Exeter 5.
C. oblonga. B. Wakehurst†; U. Rostrevor.
C. robusta. K. Headfort, Leonardslee† 6; B. Wakehurst†; U. Rostrevor.
C. verrucosa. U. Rostrevor (one K.).
Calluna vulgaris. K. Leonardslee; B. Aldenham, Nymans (var.) 10.
Calycanthus floridus. K. Dawyck.
C. glaucus. B. Aldenham (some S.).
C. occidentalis. B. Aldenham (some S.); U. Enfield.
Calycotome infesta. U. Rostrevor.
C. spinosa. K. Abbotsbury (some), Glasnevin; U. Rostrevor.
**Calystegia macrostegia*. B. Rostrevor†.
Calythrix Sullivanii. U. Ludgvan.
Camellia cuspidata. U. Lanarth, Slough.
C. reticulata. G. Tal-y-Cafn† N.; U. Bosahan; Wakehurst† 3.
C. Sasanqua. K. Crawley 8; S. Lanarth; U. Enfield 7.
C. Thea. S. Lanarth.
Campanula amabilis. K. Wisley.
C. pyramidalis. U. Isleworth.
C. Steveni. K. Wisley.
Cantua dependens. K. Abbotsbury 4; B. Rostrevor†.
Caragana altaica. } U. Aldenham.
C. arborescens. }
C. Boissii. }

- Caragana decorticans*. U. Aldenham, Westonbirt.
C. jubata.
C. sibirica. } U. Aldenham.
C. tragacanthoides. }
Carissa bispinosa. K. Abbotsbury 4.
Carmichaelia australis. K. Headfort, Lanarth; B. Abbotsbury,
Wakehurst; S. Glasnevin; U. Fota, Rostrevor.
C. Enysii. U. Rostrevor.
C. anguliformis. K. and B. Aldenham; S. Nymans, Rostrevor.
C. odorata. K. Glasnevin; U. Rostrevor.
C. Williamsii. B. Ludgvan.
Carpenteria californica. K. Downham; G. Romford 15; B. Crowsley,
Dorking 8 (also S.), Enfield 7, Leonardslee 7, Monreith† 8,
Oxon, Tortworth 16, Wakehurst (also S.), Grinstead; S. Carnarvon
6, Epping 12, Exeter 17, Glasnevin, Lyndhurst†, Mangotsfield
4, Nymans† 6, Stow†, Wisley; U. Aldersey† 12, Kew.
Carpinus americana.
C. cordata. } U. Aldenham.
C. japonica. }
C. Maximowiczii. U. Westonbirt.
Carpodetus serratus. K. Abbotsbury; B. Leonardslee 5; U.
Rostrevor.
Carya alba.
C. amara.
C. aquatica.
C. caroliniana.
C. cordiformis. } U. Aldenham.
C. glabra. }
C. laciniosa. }
C. microcarpa. }
C. porcina. }
C. septentrionalis. }
Caryopteris Mastacanthus. K. Stevenage 3; B. Aldenham (also S.)
Aldersey† 5, 10; U. Enfield 15, Mangotsfield 5.
Cassia bicapsularis. K. Abbotsbury.
C. corymbosa. K. Headfort, Lanarth, Llandaff† 6, Mangots-
field† 2; G. Fota† 15, Nymans† 6; B. Ludgvan; S. Trebah,
16 (lost 4 feet of wood); U. Bosahan.
C. marylandica. K. Abbotsbury 4.
C. tomentosa. K. Abbotsbury 4, Headfort.
Cassinia fulvida. B. Aldenham (some S.), Wisley 6-12; S. Enfield.
C. leptophylla. K. Aldenham, Crawley 4, Wisley 4; B. Abbotsbury;
S. Rostrevor; U. Westonbirt, Wisley (seedlings).
C. retorta. U. Rostrevor.
Castanea Duclouxii. } U. Aldenham.
C. koratensis. }
Castanopsis chrysophylla. K. and B. Lanarth (small); U. Alden-
ham, Enfield 17, Mangotsfield 3.

- Casuarina Cunninghamiana*. K. Rostrevor.
C. distyla. K. Rostrevor.
C. equisetifolia. B. Rostrevor.
C. glauca. K. Headfort, Rostrevor.
C. lepidophloia. K. Rostrevor.
C. quadrangularis. K. Abbotsbury.
C. suberosa. K. Rostrevor.
Catalpa Fargesii. } U. Aldenham.
C. speciosa. }
Ceanothus azureus. K. Carnarvon 6, Farnborough 20, Gatton,
Harrow† 9; G. Hargham, Harrow† 9, Hever 7, Oxon;
B. Aldenham (also B.), Aldersey, Edenhall 10, S. Molton 6,
Wisley 12.
C. dentatus. K. Aldenham, Ashford, Edenhall 4, Kew†, Tortworth,
Wakehurst; B. Oxon†; S. Monmouth 25.
C. divaricatus. K. Edenhall 4, Epping 2; B. Headfort; S. Car-
narvon† 5.
**C. Gloire de Versailles*. K. Aylesbury† 15, Harrow 8; G. Oxon;
B. Woodbridge†; S. Aldenham, Byfleet, Epping 18, Hever 6,
Stow† 3, Nymans 10; U. Enfield.
**C. Marie Simon*. B. Farnborough.
C. pallidus. S. Woodbridge.
C. papillosus. K. Wakehurst; B. Lanarth.
C. rigidus. K. Colesborne†, Kew†, Llandaff 1, Mangotsfield 4;
B. Lanarth, Romford 6.
C. thyrsiflorus. K. Aldenham (old G. and B.), Bergholt 3, Coles-
borne†; B. Crawley 9; S. Crowsley, Stow†.
C. thyrsiflorus var. *griseus*. B. Glasnevin.
C. Veitchianus. K. Aylesbury† 15, Hever (also B.) 6, Kew†,
Stow, Woodbridge (open); B. Aldenham, Crawley 9, Crowsley,
Epping 17, Glasnevin, Headfort, Hever, Hitchin†, Lanarth,
Nymans† 8, Romford, Stevenage, Wakehurst, Whitby 3,
S. Carnarvon† 5, Mangotsfield† 3, Uckfield 6, Woodbridge†.
C. velutinus (?). U. Hargham† 5.
Cedrela sinensis. U. Tortworth 5.
Cedrus atlantica. Northwich, lost leaves.
Celastrus ngulatus. } U. Aldenham.
C. articulatus. }
**C. latifolius*. U. Aldenham, Burnham.
C. Loeserieri. S. Aldenham.
C. scandens. U. Aldenham.
Celtis Audibertianus. S. Aldenham.
C. Georgiana. B. Aldenham.
C. occidentalis. } S. Aldenham.
C. occidentalis pumila. }
C. scaber. K. Fota 7.
Cephalanthus occidentalis. U. Aldenham.
C. occidentalis var. *angustifolia*. B. Aldenham.

- Cephalotaxus drupacea*. U. Aldenham.
Ceratonia Siliqua. K. Abbotsbury 15; B. Leonardslee† 3.
 **Ceratostigma Willmottianum*. S. Enfield† 2; U. Kew.
Cercidiphyllum japonicum. B. Stevenage; U. Aldenham, Enfield.
 **Cercis chinensis*. B. Nymans 2; S. Aldenham, Lanarth; U. Leonardslee 4.
 **C. racemosa*. U. Lanarth (15 feet by 8 feet).
Cestrum aurantiacum. K. Abbotsbury; U. Bosahan.
C. elegans. K. Abbotsbury; G. Wakehurst† 7; B. Rostrevor.
C. fasciculatum. B. Headfort; S. Rostrevor.
C. Newellii. K. Abbotsbury, Nymans 6; G. Lanarth (also B.); S. Rostrevor.
C. Parqui. K. Glasnevin; G. Enfield; B. Rostrevor.
C. vespertinum. K. Abbotsbury.
Chamaerops humilis. B. Guildford 20 (thatched), Wakehurst (open), S. Hayling Island 5; U. Bosahan.
Cheiranthus vars. K. and B. Hever.
Chilianthus oleaceus. B. Rostrevor.
Chimonanthus fragrans. B. Crowsley; U. Aldenham, Enfield.
Chionanthus retusus } U. Aldenham.
C. virginicus. }
Choysia ternata. K. Aldersey (older plants S.), Hever 7 (also B.), Stow (old plants); G. Chipping Norton 20, Colesborne, Hitchin 9 (open to N.), Romford, South Molton, Wye; B. Aldenham (also S.), Glasnevin, Headfort, Hever, Hitchin 5 (open to S.), Oxon; S. Aldersey (old plants), Burnham 10, Enfield 20, Hayling Island 8, Mangotsfield† 5, Monmouth 7, Nymans 6, Slough 2, Uckfield 7.
Chrysanthemum nipponicum. K. Grinstead.
Cineraria Heritieri. K. Rostrevor (others U.).
C. maritima. B. Grinstead.
Cinnamomum Camphora. U. Rostrevor.
C. officinarum. K. Rostrevor.
Cistus. K. Bettws (a few old plants), Colesborne (nearly all species), Gatton (most), Grinstead (many), Kew (all except *laurifolius*, *cyprinus*, *Corbariensis*, and *Loretii*), Wakehurst (except *cyprinus*, *ladaniferus*, and *purpureus*).
C. albidus. K. Headfort, Stevenage 10, Wisley 5.
C. corbariensis. K. Aldenham (also B.), Tortworth 3; B. Wisley, Enfield; S. Kew.
C. cyprinus. B. Aldersey 6 (also S.), Lanarth; S. Kew, Woodbridge 6; U. Woodbridge 1 and 2.
C. florentinus. K. Aldenham, Aldersey, Enfield, Harrow 4 (one plant B.), Nymans 6, South Molton 5, Slough 2; G. Lyndhurst 10, Oxon; B. Epping, Stow 5, Wisley 1-9.
C. hirsutus. K. Aldenham, Enfield.
C. ladaniferus. K. Aldersey, Wisley 1-10; B. Aldenham, Dorking 10; U. Wisley (small plants in pots).

- Cistus ladaniferus* var. *immaculatus*. K. Tal-y-Cafn.
C. laurifolius. B. Aldenham (also S.); U. Aldersey†, Enfield, Kew, Mangotsfield 5, Stevenage.
C. Loreti. K. Abbotsbury, Carnarvon, Harrow 3, Monreith 4 (also U.); S. Kew.
C. lusitanicus. K. Aldenham, Enfield 10, Sherborne 7, Slough 2, Wisley 6.
C. monspeliensis. K. Aldenham, Enfield 12; B. Wisley 5.
C. platysepalus. K. Aldenham.
C. purpureus. K. Abbotsbury, Aldenham (also B.), Aldersey, Bergholt (young plants), Enfield 6, Epping 2-6, Harrow 8, Hitchin 3, Mangotsfield 2, Monreith 2 (also U.), Nymans 6, Slough 2, South Molton 5, Tal-y-Cafn; Woodbridge 1 and 2.
C. salvifolius. K. Carnarvon, Epping, Headfort, Sherborne 7; B. Wisley 5.
C. vaginatus. K. Rostrevor.
C. villosus. K. Aldersey, Bergholt 8, Carnarvon, Headfort, Nymans 6, Wisley 10.
Citharexylum Bessonianum. K. Nymans 5; B. Abbotsbury, Glasnevin; U. Rostrevor.
C. reticulatum. S. Rostrevor.
Cladrastis amurensis. } U. Aldenham.
C. tinctoria. }
Clematis Armandi. G. Epping 5, Llandaff 1; U. Aldenham, Enfield 7, Westonbirt.
C. cirrhosa. K. Glasnevin; S. Enfield.
C. coccinea. U. Aldenham.
C. Delavayi. K. Dawyck.
C. grandidentata. }
C. Gouriana. } U. Aldenham.
C. grata. }
C. indivisa lobata. U. Rostrevor.
**C. Jouiniana*. U. Aldenham, Enfield 10.
C. macrophylla. U. Aldenham.
C. montana. K. Northwich 10.
C. orientalis tangutica. U. Aldenham.
**C. orientalis obtusiuscula* Farrer 342. K. Bergholt (30 plants, 2 years); U. Enfield 2, Wisley 1.
C. Poroliniana. K. in open Kew; U. on walls.
C. uncinata. }
C. veratrifolia. } U. Aldenham.
C. Walteri. }
C. 848 Purdom. }
C. 11307 Forrest. K. Aldenham.
Clerodendron Fargesii. U. Aldenham.
C. mandarinorum 425 Wilson. K. Aldenham.
C. trichotomum. S. Aldenham (also U.); S. Hayling Island 4, Slough, 3, Wisley 12; U. Wisley 12.

- Clethra arborea*. K. Leonardslee† 5; G. Abbotsbury; B. Rostrevor.
Chianthus puniceus. K. Abbotsbury, Llandaff 7 (matted), Wisley;
 Leonardslee† 7, Headfort, Rostrevor (also B.), Wakehurst† 4;
 G. Enfield†, Monreith† 3 (also B.); B. Fota† 5 (old).
Cocculus variabilis. U. Aldenham, Enfield.
 **Cocos Yatay* (Reg. Argent). U. Fota.
 **Codonopsis Bulleyana*. U. Wisley 3.
Colletia cruciata. K. Carnarvon 4; G. Leonardslee 20, Wisley 6;
 B. Aldenham, Enfield 7, Mangotsfield 1; S. Nymans 6,
 Uckfield 8.
C. infausta (*spinosa* of gardens). K. Grinstead, S. Aldenham; U.
 Enfield.
Colquhounia vestita. U. Rostrevor.
Colutea cruenta. U. Aldenham, Enfield.
C. media. U. Aldenham.
C. melanocalyx. U. Aldenham, Enfield.
C. pygmaea. U. Aldenham.
Convolvulus Cneorum. K. Aldenham, Dorking 3, Enfield 6,
 Glasnevin, Mangotsfield, Monreith 4 (1 plant U.), Nymans 6,
 Tal-y-Cafn (also B.); G. Wisley; S. Grinstead, Wakehurst† 4.
Coprosma Cunninghamii. U. Rostrevor.
C. lucida. K. Glasnevin, Enfield 1; B. Leonardslee 4; U. Rostrevor.
C. Petriei. U. Enfield 9, Rostrevor.
C. propinqua. S. Aldenham; U. Enfield 5; Rostrevor.
C. robusta. S. Nymans 4.
C. tenuicaulis. B. Abbotsbury.
Cordyline australis. K. Crowsley, Glasnevin (also G.), Lanarth
 (young plants), Headfort, Uckfield (also G., B., and S.) 7, Wake-
 hurst 7, Wisley 7; G. Ashford, Enfield 8, Nymans 4; S.
 Lanarth; U. Bosahan.
C. Banksii. K. Crowsley 9.
C. indivisa. K. Lanarth (S. in shelter); S. Glasnevin.
C. lentiginosa. K. Glasnevin.
Cordyline × *Van Groot* (*Doucettii* × *indivisa*). K. Rostrevor.
Coriaria angustissima. S. Aldenham.
C. japonica. K. Slough 4; U. Aldenham.
C. myrtifolia. U. Aldenham.
C. sinica. S. Aldenham.
C. terminalis. U. Aldenham, Enfield.
Cornus alternifolia. U. Aldenham.
C. capitata. K. Aldersey †, Ashford, Hayling Island (one plant),
 Sherborne 12, Wakehurst (also B.), Wye; G. Wisley 6;
 B. Crawley 9, Exeter 14, Glasnevin; S. Hayling Island 8,
 Leonardslee† 12 (injured 1908-9); U. Nymans.
C. controversa. U. Aldenham, Leonardslee 5.
C. fastigiata. B. Aldenham.
C. florida. U. Aldenham.
C. Kousa. K. Stevenage; U. Aldenham.

- Cornus Nuttallii*.
C. paniculata.
C. paucinervis. } U. Aldenham.
C. poliophylla. }
C. Wilsonii. S. Wakehurst.
Corokia buddleioides. G. Lanarth; B. Grinstead, Lanarth, Wakehurst†; U. Ludgvan.
C. Cotoneaster. B. Glasnevin, Wisley 6; S. Aldenham, Llandaff; U. Enfield 10, Leonardslee 10, Ludgvan, Mangotsfield 5, Nymans, Rostrevor.
C. macrocarpa. B. Nymans 5; U. Ludgvan, Rostrevor.
C. virgata. G. Wakehurst 4; B. Aldenham; S. Monreith 2; U. Rostrevor.
Coronilla glauca. K. Headfort, Mangotsfield† 3; S. Grinstead, Lanarth.
C. valentina. K. Abbotsbury, Headfort, Llandaff 2.
Correa alba. K. Carnarvon 2, Rostrevor.
C. magnifica. K. Enfield† 7, Glasnevin, Rostrevor.
C. speciosa. K. Glasnevin, Lanarth.
Cortaderia argentea. K. Hitchin 22 (exposed), Oxon (also G.); G. Tortworth 30; B. Aldersey 6; S. Hitchin (sheltered, west aspect), 6.
Corydalis thalictrifolia. K. Wisley.
C. Wilsonii. U. Wisley.
**Corylopsis platypetala*. U. Kew.
C. spicata. B. also S. Aldenham.
**C. Veitchiana*. U. Kew.
**C. Willmottiae*. U. Kew.
Corylus Colurna. }
C. sinensis. } U. Aldenham.
Corynocarpus laevigatus. K. Headfort.
**Cotoneaster*. All new Chinese. U. Kew.
C. acuminata. U. Aldenham, Westonbirt.
C. acutifolia. U. and S. Aldenham.
C. adpressa. U. Aldenham.
C. amoena. U. Burnham; S. Aldenham.
C. bacillaris. U. Aldenham.
C. bullata. U. Aldenham, Burnham, Westonbirt.
C. congesta. U. Aldenham.
C. Dammeri.
C. Dammeri var. *radicans*. } U. Aldenham.
C. Dielsiana. U. Aldenham, Leonardslee 6, Westonbirt.
C. Dielsiana var. *elegans*. U. Westonbirt.
C. divaricata. U. Aldenham.
C. frigida. S. Aldenham; U. Enfield.
C. Harroviana. U. Burnham.
C. Henryana. U. Aldenham.
**C. horizontalis perpussilla*. B. Aldenham (less hardy than type).

- Amelanchier hupehensis*. U. Westonbirt.
Antegerrimus. S. Aldenham.
axiflora. U. Aldenham.
multiflora. U. Aldenham, Enfield.
nearyensis. U. Aldenham.
pinnosa. B. Aldenham ; U. Burnham.
racemiflora var. *Meyeri*. U. Aldenham.
salicifolia var. *floccosa*. U. Aldenham ; Enfield.
salicifolia var. *rugosa*. K. Dawyck ; S. Aldenham ; U. Burnham, Enfield.
Sargentii. U. Westonbirt.
spumifolia. S. Nymans, Enfield.
uniflora. } U. Aldenham.
umbellata. }
Zabelii. S. Aldenham.
5567 Forrest. } U. Aldenham.
5570 Forrest. }
10419 Forrest. B. Aldenham.
4414 Vilmorin. U. Aldenham.
galledon agavoides. U. Rostrevor.
carinosa. S. Enfield (covered) ; U. Rostrevor.
rostrata. U. Rostrevor.
umbellata sarcocaulis. K. Harrow 4 ; S. Enfield (covered).
Crataegus apiifolia. S. Aldenham.
atrolus.
Caricri.
chlorosarca.
cuneata.
Doppeliana.
hungarica.
Korolkowii. } U. Aldenham.
melanocarpa.
orientalis.
pinnatifida.
sibirica.
tanacetifolia.
uniflora.
virginica. } S. Aldenham.
viridis. }
 All the numerous forms of *Crataegus* from N. America, except one
 two, such as *C. apiifolia* and *C. spathulata*, whose habitat is the
 northern U.S.A., uninjured at Aldenham.
Crataegus-Mespilus Dardari. } U. Aldenham.
Mespilus Asnièresii. }
Crataegus giganteum. K. Isleworth.
Johnstonii. S. Dorking.
longifolium. U. Isleworth, Enfield.

- Crinum Moorei*. K. Dorking (others G.), Isleworth; S. Enfield (covered with fir boughs).
C. Powellii. B. Guildford 8; S. Dorking (started 2 months late); U. Enfield 7 and 10, Isleworth.
C. Worsleyi and others. K. Isleworth.
C. yemense. } U. Isleworth.
C. yuccaeoides. }
Crossosoma californicum. B. Rostrevor.
Cryptomeria japonica. U. Aldenham.
Cudrania triloba. U. and S. Aldenham.
Cunninghamia lanceolata. S. Aldenham; U. Rostrevor.
Cupressus bermudiana. K. Headfort.
C. cashmiriana. K. Glasnevin; S. Nymans 10; U. Rostrevor (one S.).
C. Duclouxiana. S. Aldenham.
C. formosensis. K. Aldenham (also B.); Kew (also G., B., and S.); Tortworth 3; B. Wakehurst† 2; S. Headfort.
C. funebris. K. Aldenham (also B.), Carnarvon (young plant older 25 years, 15 to 20 ft. B.); B. Glasnevin; S. Wakehurst.
C. Goveniana. } U. Aldenham.
C. horizontalis. }
C. Lawsoniana. B. Aldenham (exposed to E., otherwise S.), Norwich 35, S. Molton.
C. lusitanica. K. Nymans 18; B. Bosahan 4, Colesborne 5, Glasnevin, Nymans 19, Uckfield.
C. lusitanica var. *Benthamii*. B. Glasnevin, Leonardslee 6; S. Headfort, Uckfield 7, Wakehurst.
C. Macnabiana. K. Nymans 16; S. Headfort.
C. macrocarpa. K. Chipping Norton 10, Colesborne 10; B. Chipping Norton (very old), Exeter 6 (side exposed to E. killed back S. Aldenham).
C. macrocarpa var. *compacta*. B. and S. Uckfield 7.
C. macrocarpa var. *lutea*. U. Aldenham, Enfield.
C. nootkatensis. U. Aldenham.
C. sempervirens. K. Carnarvon 6, Colesborne 6; U. Enfield 3 at.
C. torulosa. B. Glasnevin; S. Wakehurst.
Cyathodes robusta. U. Rostrevor.
Cydonia cathayensis. U. Aldenham, Enfield.
C. japonica Wilsonii. K. Dawyck; S. Aldenham; U. Westwood.
C. sinensis. K. Glasnevin; S. Aldenham.
Cyrilla racemiflora. B. Nymans 6; Wisley 1.
Cyrtanthus Macowanii. U. Isleworth (kept dry).
Cytisus aeolicus. } K. Aldenham.
C. albus durus. }
C. austriacus. U. } Aldenham.
C. biflorus. U. }
C. capitatus. S. }
C. decumbens. B. and S. }

- sis filipes*. K. Headfort, Rostrevor.
ragrans. K. Nymans 3.
eucaanthus. B. Aldersey 10; U. Aldenham.
inifolius. K. Headfort, Rostrevor.
nigrans. U. Aldenham, Enfield, Wisley.
braccos. K., B., and S. Molton 9.
tridiferns. B. Rostrevor; U. Lanarth 10.
purpureus. G. Aldersey 5, Lanarth (also B.); U. Aldenham.
acemosus. U. Rostrevor.
sessilifolius. U. Aldenham, Enfield.
sepparius. B. Cobham; S. Aldenham.
crisicolor. U. Aldenham, Enfield, Wisley.
argatus. U. Aldenham, Enfield.

ecia polifolia. K. Kew (old plants, others B. and S.); G. Farnborough 10, Glasnevin; B. Crowsley, Enfield, Lanarth (if exposed to E.), Stow; S. Nymans 15.
rydium Bidwillii. S. Wakehurst 1.
Colensoi. U. Rostrevor.
cupressinum. K. Headfort, Nymans 2; U. Rostrevor.
Franklinii. U. Rostrevor.
s cotinifolia. B. Rostrevor.
nnacanthus indicus. S. Llandaff 2; U. Rostrevor.
hne Blagayana. K. Wakehurst; U. Aldenham.
Cneorum. U. Aldenham, Aldersey.
Cneorum var. *major*. K. Burnham 2.
Giraldii. U. Wakehurst 3.
odora. K. Wisley; S. Enfield† 4.
pontica. U. Aldenham, Enfield 8.
retusa. U. Enfield 6, Wakehurst.
Strophylleum humile. U. Aldenham.
macropodium. K. Dawyck; S. Enfield; U. Aldenham.
vidua involuerata. K. (nearly all) Dawyck; U. Aldenham, Burnham, Leonardslee 8, Wakehurst 10, Westonbirt.
lata. U. Wakehurst 3.
caisnea Fargesii. U. Aldenham, Burnham, Enfield 8, Mangotsfield 2, Stow, Tortworth 4, Wakehurst 6, Westonbirt.
inantha coerulea. U. Enfield, Monreith, Rostrevor.
drumecoon rigidum. K. Lanarth† 14, Rostrevor†, Wakehurst†; G. Leonardslee† 9.
dropanax japonica. U. Rostrevor.
fontainia spinosa. K. Dawyck, South Molton 4, Stow 3; B. Uckfield 7; S. Wakehurst (also U.); U. Nymans.
medium tiliaefolium. G. Stow; B. Enfield 15, Glasnevin.
stia corymbosa } U. Aldenham.
renala }
bicolor. S. Aldenham.
racilis. U. Aldenham.

- Deutzia longifolia*. U. Aldenham, Westonbirt.
D. mollis. U. Aldenham.
D. scabra. B. Aldenham; S. Glasnevin; U. Westonbirt.
D. Vilmorinae. U. Burnham.
D. Wilsonii. U. Westonbirt.
Dianella coerulea. G. Enfield 6; U. Rostrevor.
D. tasmanica. K. Aldenham; U. Rostrevor.
Dianthus arboreus. K. Enfield, Kew.
D. fruticosus. K. Enfield, Kew.
Dicksonia antarctica. K. Nymans 6; B. Lanarth 12; U. Rostrevor.
Dichroa febrifuga. K. Glasnevin.
Dierama pulcherrimum. K. and B. Aldersey 4; B. Enfield 2-8.
Diervilla florida. U. Aldenham.
Diosma ericoides. K. Fota 3, Hayling Island 8, Rostrevor†.
**Diospyros Lotus* (W. 441). S. and U. Aldenham; U. Hargham.
D. virginiana. S. Aldenham (small plants K.).
Dipelta floribunda. U. Aldenham.
D. ventricosa. U. Aldenham, Barnham.
Diplarrhena Moraea. B. Rostrevor.
Diplopappus fonticola. K. Abbotsbury.
Dipteronia sinensis. S. Aldenham; U. Wakehurst 6.
Dirca palustris. U. Aldenham.
Dodonaea tenuifolia. K. Headfort.
D. viscosa. K. Rostrevor.
Dorycnium hirsutum. K. Glasnevin.
D. latifolium. K. Crawley 4.
Douglasia praetutiana? K. Harrow 4, Wisley.
Dracophyllum arboreum. U. Ludgvan.
Drimys aromatica. K. Enfield 1; U. Bosahan, Crowsley, Wakehurst.
D. colorata. U. Rostrevor.
D. Winteri. K. Dawyck, Exeter (young plants), Stow; G. Enfield 1; B. Aldenham, Crowsley, Llandaff 2, Wakehurst; S. Glasnevin, Uckfield; U. Bosahan.
Dryandra formosa. U. Rostrevor†.
Dyckia rariflora. K. Isleworth.

Eccremocarpus scaber. B. Wakehurst†; S. Enfield†.
Edgeworthia chrysantha. K. Wakehurst† 6.
Ehretia serrata. K. Carnarvon 3; B. Abbotsbury, Wakehurst†.
Elaeagnus angustifolia. U. Enfield.
E. argentea. U. Aldenham.
E. macrophylla. B. Wakehurst† 1; U. Aldenham.
E. multiflora. A. Aldenham, Enfield, Leonardslee 6.
E. pungens. } U. Aldenham.
E. umbellata. }
Eleutherococcus Henryi. U. Aldenham.

- Scholtzia Stauntonii*. S. Aldenham.
- Stethrium coccineum*. B. Glasnevin, Tal-y-Cafn † (old plants) 10 ; S. Lanarth, Tal-y-Cafn † 4, Wakehurst (also U.) ; U. Bosahan 15, Fota, Poolewe, Rostrevor, Wakehurst, Westonbirt.
- Stianthus campanulatus*. U. Aldenham.
- Staphylea japonica*. K. Stevenage (also B.) ; U. Aldenham ; Mangotsfield 3 ; Westonbirt.
- Staphylea trifolia*. K. Carnarvon ; S. Enfield 6 ; U. Rostrevor.
- Staphylea trifolia*. U. Aldenham.
- Staphylea trifolia*. B. Glasnevin ; U. Aldenham.
- Staphylea trifolia* var. *alpina*. U. Enfield.
- Staphylea trifolia*. K. and B. Kew 20 ; U. Stow 4 ; Wakehurst.
- Staphylea trifolia*. B. Rostrevor.
- Staphylea trifolia* (lusitanica). G. Wisley, 4-9 ; B. Crowsley, Kew (also S.) ; S. Glasnevin ; U. Nymans ; Wakehurst.
- Staphylea trifolia*. K. and B. Kew 10 ; U. Aldenham.
- Staphylea trifolia*. B. Aldenham (also U.) ; B. Crowsley, Glasnevin (compact forms S.) ; S. Enfield.
- Staphylea trifolia*. K. Trebah.
- Staphylea trifolia*. B. Glasnevin ; U. Enfield 20.
- Staphylea trifolia*. K. Kew old plants (also B.), Mangotsfield 3, Stow 4 ; G. Wisley 2-9 ; B. Glasnevin, Enfield 9.
- Staphylea trifolia*. K. Harrow 1 ; S. Enfield 6 ; U. Aldenham.
- Staphylea trifolia*. K. Cobham (sheltered) (U. exposed) ; B. Wakehurst† (also S.) ; S. Enfield.
- Staphylea trifolia*. Aldenham (K. and B. open ; U. on wall).
- Staphylea trifolia*. K. and G. Enfield 15 ; G. Wisley 10.
- Staphylea trifolia*. K. Crowsley ; Enfield 3 and 4.
- Staphylea trifolia* × *exoniensis*. B. South Molton 6 ; S. Aylesbury† 5 ; Monreith 6.
- Staphylea trifolia* (montevidensis). G. Glasnevin ; B. Colesborne†, Enfield† 7, Fota, Headfort, Nymans 4, Stevenage 4 ; S. Wakehurst†.
- Staphylea trifolia*. G. Glasnevin ; B. Kew 30.
- × *Staphylea trifolia*. K. Oxon† ; B. Wisley 5 ; S. Aldenham, Enfield, Lanarth ; U. Aldersey, Stow, Tortworth, Westonbirt† N.
- Staphylea trifolia*. K. Aylesbury† (also B.) 20, Exeter (also S.) ; G. Chipping Norton 16, Wisley 9 ; B. Aldenham, Downham†, Headfort, Leonardslee 15, Oxon, Monmouth† W. 20, S. Molton, Tortworth 12 ; S. Hever, Sherborne 16, Stow, Wakehurst† (and open) ; U. Nymans.
- Staphylea trifolia*. K. Abbotsbury, Crawley 4, Leonardslee 5, Nymans 6, Wakehurst† 4 ; B. Aldenham, Glasnevin.
- Staphylea trifolia*. B. Aldenham† ; U. Enfield.
- Staphylea trifolia*. G. Wisley 8 ; B. Crawley 5.
- Staphylea trifolia*. B. Enfield†, Glasnevin.
- Staphylea trifolia*. B. Aldenham.
- Staphylea trifolia*. G. Glasnevin.

- Escallonia rubra*. B. Glasnevin.
E. viscosa. B. Glasnevin, Kew 30.
Eucalyptus all species. K. Crawley; S. Abbotsbury.
E. acervula. S. Rostrevor.
E. alpina. K. Rostrevor.
E. amygdalina. K. Headfort, Leonardslee, Wakehurst⁺; Rostrevor.
E. Beauchampiana. K. Leonardslee 4.
E. cinerea. K. Enfield (also B.); U. Rostrevor.
E. citriodora. G. Glasnevin.
E. coccifera. K. Hargham 6 (slight shelter); G. Dorking 11; Hargham 7 (sheltered); B. Stow; S. Glasnevin, Wakehurst; U. Enfield 8, Rostrevor.
E. cordata. K. Headfort, Leonardslee 4; B. Enfield 10; Rostrevor.
E. coriacea. K. Headfort; B. Wakehurst.
E. delegatensis. K. Rostrevor.
E. ficifolia. K. Abbotsbury.
E. Globulus. K. Downham, Leonardslee 4, Osterley, Sherbourn 11, Slough 3, Wakehurst; G. Ashford (1 ft. diameter), Enfield 1; U. Bosahan (80 ft. high), Rostrevor.
E. Gunnii. K. Aldenham (also B.), Aldersey (also S.) 5, Hayling Island 6; G. Colesborne 10; B. Carnarvon 50, Glasnevin; Hargham (cut to stem, shot in May), Exeter 16; S. Lanarth; Wakehurst, Whitby 18; U. Enfield.
E. haemastoma. U. Rostrevor.
E. leucoxydon. B. Rostrevor.
E. Macarthuri. K. Wakehurst; U. Rostrevor.
E. Maidenii. K. Kew 5; U. Rostrevor.
E. Muellieri. K. Headfort; U. Rostrevor; Wakehurst.
E. obliqua. S. Rostrevor (one K.); U. Enfield 3; Uckfield.
E. paniculata. K. Glasnevin.
E. pauciflora. U. Rostrevor.
E. pulverulenta. K. Enfield 6, Lanarth 10 (also B.); S. Isleworth.
E. resinifera. G. Glasnevin; B. Rostrevor.
E. rubida. K. Glasnevin, Wakehurst.
E. Smithii. K. Glasnevin.
E. stellulata. U. Rostrevor.
E. Stuartiana. K. Hargham 6, Kew 5; G. Glasnevin; B. Enfield 10.
E. urnigera. K. Hargham 5, Hayling Island 6 (and B.), Headfort (two plants U.); G. Tortworth 7; S. Glasnevin, Enfield; Lanarth 10, Leonardslee 5 (injured in 1908), Lyndhurst 4; Wakehurst; U. Rostrevor.
E. vernicosa. U. Enfield; Rostrevor, Uckfield, Wakehurst.
E. viminalis. K. Headfort, Leonardslee 5; G. Glasnevin (also B.).
E. whittinghamensis. K. Aldenham (also B.); G. Colesborne 10; S. Enfield 12, Glasnevin, Kew 20; U. Wakehurst 12.

- Eucommia ulmoides*. U. Aldenham, Enfield 8, Leonardslee 6, Wakehurst 8, Wisley 9.
- Euryphia Billardieri*. U. Rostrevor.
- E. cordifolia*. K. Aldenham, Crowsley, Enfield 1, Lanarth 2 (also S. 12), Uckfield 1; B. Crawley 5, Glasnevin, Kew 6, Nymans 8; S. Tal-y-Cafn† (10 plants) 2-10, Nymans 8; U. Ludgvan.
- pinnatifolia*. G. Dorking; S. Wisley 15; U. Aldenham, Aldersey, Enfield 16, Wakehurst, Westonbirt.
- genia myrtifolia*. B. Abbotsbury; U. Rostrevor.
- onymus alatus*.
- americanus*.
- Bungeanus*.
- europaeus* var. *atropurpureus* } U. Aldenham.
- imbriatus*. S. Wakehurst 1.
- Hamiltonianus*. G. Glasnevin; S. and U. Aldenham.
- laciniatus*.
- lanceifolius*.
- latifolius*.
- nanus*.
- odoratus*.
- planipes*.
- radicans*.
- radicans* var. *microphylla*. B. Aldenham.
- sachalinensis*.
- Sieboldianus*.
- terracosus*.
- Wilsonii*. U. Aldenham, Kew.
- ylensis*. U. Aldenham.
- spodium deltoideum*. B. Rostrevor (recovered rapidly).
- Purpureus*. B. Rostrevor (slow recovery).
- Weinmannianum*. K. Wakehurst 4; G. Enfield 7, Glasnevin, Nymans 4; S. Rostrevor.
- phorbia biglandulosa*. K. Aldersey 1; B. Enfield 10, Rostrevor.
- dendroides*. K. Grinstead.
- mellifera*. G. Enfield 10, Glasnevin; S. Rostrevor.
- Wulfenii*. K. Aldersey (also B.) 2-6, Enfield, Gatton 7, Mangotsfield 4, Slough 7; B. Aldenham, Harrow (also S.).
- pedica Davidiana*. U. Aldenham, Colesborne, Tortworth 5, Wakehurst.
- Franchetii*. S. Aldenham; U. Wakehurst.
- polyandra*. U. Aldenham.
- rya chinensis*. U. Aldenham.
- aponica*. S. Aldenham.
- latifolia*. K. Abbotsbury.
- dia Baudouini*. G. Glasnevin.
- hupehensis*. U. Aldenham.

Evodia P. 321. K. Dawyck.

Exochorda *Alberti*.

E. dentata.

E. Giraldii.

E. grandiflora.

} U. Aldenham.

Fabiana imbricata. K. Aldenham, Enfield (also B.) 2, Glasnevin (in shade), Guildford 10, Hever 4, Mangotsfield 3, Monreith 1, Sherborne 15, Stow, Tortworth 2, Wisley 6; B. Wakehurst 1; S. Exeter; U. Glasnevin (in sun), Nymans.

Fagus asiatica. } U. Aldenham.

F. Engleriana. }

F. fusca. B. Ludgvan.

F. japonica.

F. lucida.

F. orientalis. } U. Aldenham.

F. Sieboldii.

Fatsia japonica. U. Aldenham.

Feijoa Sellowiana. G. Guildford 10, Wisley 4; B. Enfield 7, Llanwr 12, Wakehurst†; S. Fota 7; U. Rostrevor†.

Fendlera rupicola. K. Wisley; U. Enfield, Wakehurst†.

Fig. B. Downham 20, Glasnevin, Oxon†; S. Slough 1-4.

Fontanesia phylliracoides. B. Aldenham.

Forestiera acuminata. K. Aldenham.

**Fortuncaria sinensis*. U. Kew (open).

Fothergilla alnifolia.

F. caroliniana.

F. major.

Fraxinus americana.

F. anomala.

F. bracteata. S. 5 }

F. chinensis. U. 1 } Wakehurst.

F. dimorpha.

F. longicuspis.

F. mandschurica.

F. Mariesii.

F. oregona.

F. Ornus.

} U. Aldenham.

**F. Paxiana*. U. Aldenham, Colesborne, Kew.

F. pennsylvanica.

F. potamophila.

F. quadrangulata.

F. rhynchophylla.

F. Sieboldiana.

F. Späthiana.

F. texana.

F. viridis.

} U. Aldenham.

- **Fraxinus* 206. Purdom. } U. Aldenham.
 **F.* 809. Purdom. }
 **F.* 1392. Wilson. S. Aldenham.
- Fremontia californica*. K. Abbotsbury, Enfield 3, Epping 8, Wakehurst† 7 (also U.); G. Woodbridge (open); B. Crawley 8; S. Llandaff† 1, Mangotsfield† 4; U. Rostrevor, Woodbridge† S. 2-3.
- Fuchsia Colensoi*. U. Wakehurst 3.
F. corymbosa. K. Nymans 2.
F. excorticata. B. Nymans 5.
F. exoniensis. K. Aldenham.
F. exoniensis var. *corallina*. K. and G. Aldenham.
F. fulgens. K. Glasnevin.
F. gracilis. K. Oxon (also G.); G. Hever 5, Slough 2.
microphylla. K. Wakehurst (also G.†) 2; U. Bosahan.
F. pumila. K. Harrow 1; G. Enfield 15.
F. reflexa. K. Aldenham (also G.).
F. Riccartonii. G. Glasnevin, Hever 5, Slough 2; S. Aldenham, Nymans 20, Wakehurst.
F. Riccartonii fol. var. K. Harrow, G. Enfield.
- Garrya elliptica*. B. Aldersey† S. 9; B. Aylesbury 40, Lanarth 10, Glasnevin, Oxon; S. Edenhall 23, Enfield 15, Monmouth 25; U. Wakehurst.
- G. Thurettii*. B. Kew 10; U. Wakehurst.
- Gaultheria fragrantissima*. K. Dawyck.
- **G. Veitchii*. U. Leonardslee 4.
- Gaya Lyallii*. G. Guildford 2; B. Exeter (exposed side killed back) 14; S. Dorking 10, Glasnevin, Stow† 2; U. Aldenham, Enfield 7, Fota, Kew (G. in 1908-9), Ludgvan, Mangotsfield 5, Westonbirt.
- Gaylussacia* sp. U. Aldenham.
- Genista aethnensis*. K. and U. Aldenham; U. Enfield.
- G. dalmatica*. S. Aldenham.
- G. elegans*. K. Headfort; B. Rostrevor†.
- G. cphedroides*. K. Rostrevor.
- G. ferox*. K. Headfort; U. Enfield, Rostrevor (also two larger plants K.).
- G. germanica*. S. Aldenham, Enfield.
- G. hispanica*. K. Aldersey (also B.) 4, Grinstead (also B.), K. Oxon (also G.), Llandaff 3, South Molton 6; B. Aldenham, Nymans 15, Wakehurst.
- G. maderensis*. K. Headfort.
- G. monosperma*. K. Headfort.
- G. pilosa*. G. Aldersey 12; B. Mangotsfield 3; S. Glasnevin (old plant); U. Enfield 20.
- G. tinctoria*. S. Aldenham; U. Enfield.

- *Gentiana Lawrencei.* U. Wisley.
**G. sino-ornata.* U. Wisley 3.
Geum pyrenaicum. K. Wisley 4.
Gevuina Avellana. K. Wakehurst 1; U. Rostrevor.
Gladiolus tristis. K. Monreith 1.
**Glaucidium palmatum.* U. Enfield 3, Monreith.
Gleditschia caspica. S. Aldenham, Glasnevin.
G. chinensis. K. Aldenham.
G. japonica. U. Aldenham.
G. triacanthos. U. Aldenham, Enfield.
Glyptostrobos heterophyllus. K. Headfort 3, Rostrevor.
Gnidia carinata. K. Rostrevor†.
Gordonia anomala. G. Leonardslee† 3; U. Fota, Rostrevor.
G. obliqua. K. Leonardslee† 3.
Grevillea alpina. K. Rostrevor; B. Lanarth.
G. Hilliana. K. Rostrevor.
G. juniperina. K. Crawley 7.
G. longifolia. K. Nymans 3, Wakehurst† 3.
G. ornithopoda. K. Lanarth 18.
G. robusta. B. Rostrevor.
G. rosmarinifolia. K. Enfield 7, Headfort; G. Uckfield 7; B. Lanarth; S. Nymans 6.
G. sulphurea. K. Enfield 2; Kew (one plant U.); S. Nymans 6, Wakehurst; U. Fota.
Greyia Sutherlandii. B. Rostrevor.
Griselinia littoralis. K. Burnham 1; K. Kew (also B.) 6; G. Aldersey 10; U. Enfield 1, Leonardslee 20 (injured 1908).
Gunnera chilensis (manicata). K. Slough (in frames 3-7); B. Aldenham, Mangotsfield 10, Uckfield 8, Wakehurst, Enfield (crowns on N.E. side); U. Bosahan 25.
G. magellanica. S. Aldenham, U. Wakehurst.
G. scabra. K. Slough (in frame); B. Enfield 20, Epping 5, Osterley; S. Aldenham, Guildford 19; U. Wakehurst.
Gymnocladus canadensis. U. Aldenham.

- Habranthus pratensis.* U. Enfield†, Isleworth, Wakehurst.
Hakea eucalyptoides. K. Abbotsbury.
H. florida. S. Rostrevor†.
H. glabella. U. Rostrevor†.
H. pubescens. K. Abbotsbury.
H. pugioniformis. S. Rostrevor; U. Fota.
H. rugosa. U. Rostrevor.
H. saligna. K. Abbotsbury.
H. ulicina. U. Rostrevor.
Halesia diptera. }
H. hispida. } U. Aldenham.
H. tetraptera. }

- Haloragis alata*. B. Rostrevor.
Hamamelis arborea.
H. japonica, and var. *Zuccariniana*.
H. mollis.
H. vernalis.
H. virginica. } U. Aldenham.
Hedysarum multijugum. U. Aldenham.
Helianthemum. K. Aldersey (some G.), Burnham, Grinstead, Harrow
(nearly all garden forms), Oxon (some G.), Monmouth, Slough,
Stow; B. Wisley (grey-leaved stood better than green-leaved);
S. Nymans.
Helianthemum canescens. S. Enfield; B. Woodbridge.
H. formosum. K. Aldersey, Bergholt, Enfield (also B.), Woodbridge
(in open) 1; B. Aldenham; S. Nymans; Woodbridge† S. 2-3.
H. halimifolium. K. Carnarvon, Enfield (in open); S. Kew (many
K. in 1908-9); U. Enfield† S. 7.
H. Libanotis. K. Enfield 6.
H. ocyroides. K. Carnarvon, Harrow 6, Glasnevin.
H. ocyroides var. *algarvense*. K. Enfield 20, Harrow 8, Slough 4.
H. umbellatum. K. Enfield 10, Harrow 1, Slough 1; S. Kew,
(many K. in 1908-9).
Helichrysum bellidioides. B. Enfield 6, Grinstead; U. Wisley 4.
H. rosmarinifolium (*Ozothamnus*). K. Aldenham, Ashford, Enfield 5,
Exeter 10, Llandaff 2, Mangotsfield 3, Stow 1, Wakehurst
(also G.) 7, Wisley 3; G. Grinstead; B. Nymans; S. Crowsley.
H. trinerve. U. Enfield, Wisley.
Helwingia rusciflora. U. Aldenham, Enfield, Leonardslee 6.
Heteromeles arbutifolia. K. Leonardslee 2; G. Wakehurst.
Hibbertia Readii. U. Rostrevor.
Hippeastrum. K. Isleworth.
Hippophae rhamnoides.
H. rhamnoides procera. } U. Aldenham.
Hoheria populnea. G. Enfield 1; B. Nymans 5, Wakehurst†;
S. Rostrevor; U. Ludgvan.
H. populnea var. *lanceolata*. U. Fota.
**Holboellia coriacea*. U. Kew†.
H. latifolia. B. Colesborne; U. Bosahan.
Hydrangea anomala. U. Aldenham.
H. arborescens. U. Aldenham, Enfield, Wakehurst 3.
H. aspera. B. Aldenham.
H. Bretschneideri. U. Aldenham.
H. hortensis. B. Aldenham; U. Wakehurst.
H. paniculata. U. Aldenham.
H. quercifolia. G. Wakehurst; S. Enfield†.
H. radiata.
H. rosea. } U. Aldenham.
**H. Sargentiana*. G. Leonardslee; U. Aldenham.
H. setchuensis. U. Aldenham.

- Hydrangea xanthoneura*. U. Aldenham; Wakehurst.
H. xanthoneura var. *glabrescens*. U. Aldenham.
Hymenanthera crassifolia. U. Aldenham, Enfield.
H. dentata var. *angustifolia*. U. Rostrevor.
H. novae-zelandiae. U. Rostrevor.
Hymenosporum flavum. K. Rostrevor.
Hypericum arboreum. } S. Aldenham.
H. Ascyron. }
H. aureum. U. Aldenham (also B.), Enfield 16, Kew (injured in 1908-9).
H. balearicum. K. Abbotsbury, Burnham, Glasnevin, Wakehurst (also G.).
**H. Buckleyi*. K. Dawyck; U. Leonardslee.
H. calycinum. G. Chipping Norton 18; S. Aldenham, Enfield.
H. chinense. K. Romford; G. Glasnevin; S. Enfield.
H. Coris. K. Abbotsbury, Enfield, Stow; B. Harrow 2.
H. cuneatum. K. Abbotsbury.
H. densiflorum. K. Romford; U. Aldenham.
H. dubium. S. Aldenham.
H. elatum. G. Enfield; S. Aldenham.
H. fragile. K. Abbotsbury, Enfield (also G.), Glasnevin, Harrow 2, Wakehurst (also G.); B. Grinstead; S. Aldenham.
H. hircinum. S. Aldenham.
H. Hookerianum. K. Glasnevin; G. Aldersey 6; B. Aldenham, Slough 2.
H. inodorum. U. Aldenham.
H. Kalmianum. G. Glasnevin; U. Aldenham.
H. lysimachioides. S. Aldenham, Enfield.
H. Moserianum. G. Aldersey 12; Monreith (also B. and S.) 20.
H. Moserianum var. *tricolor*. K. Romford; S. Sherborne 10; Enfield 15.
H. olympicum. K. Abbotsbury, Enfield (old plants only S.), Glasnevin; Harrow 3.
H. patulum. G. Enfield (some B.) 15, Wakehurst; B. Aldenham (also S.), Oxon; S. and U. Monreith 30.
H. patulum Henryi. B. Aldenham, Slough 2; S. Stow; U. Burnham, Enfield 1.
H. reptans. K. Abbotsbury, Romford; G. Monreith (also B.) 15; B. Hever 4.
H. tomentosum. K. Romford.
H. uralum. B. Glasnevin, Enfield; S. Aldenham.
H. Webbii. S. Aldenham.
H. 7780 Vilmorin. S. Aldenham.

Ilex polycarpa. B. Enfield 6; U. Aldenham, Westonbirt.
Ilex Aquifolium. B. Northwick; S. Aldenham, Enfield (some lost leaves).
I. Aquifolium var. *Hodginsii*. B. Northwick 7 (lost leaves).
I. Cassine. B. and K. Stevenage.

- **Ilex chinensis*. S. Aldenham.
I. corallina. K. Aldenham ; S. Enfield 1, Wakehurst 4.
I. crenata. U. Aldenham, Enfield.
I. decidua. B. Aldenham.
I. diphyrena. U. Aldenham, Enfield.
I. Fargesii megalophylla. K. Aldenham ; U. Leonardslee, Wakehurst 4, Westonbirt.
I. fragilis. S. Rostrevor.
I. glabra. U. Aldenham.
I. insignis. K. Aldenham (protected) ; U. Rostrevor.
I. latifolia. S. Aldenham ; U. Wakehurst 20.
I. opaca. U. Aldenham.
I. Pernyi. U. Aldenham, Burnham, Leonardslee and most places.
I. platyphylla. U. Rostrevor.
 **I. Veitchii*. U. Burnham, Leonardslee.
I. verticillata. U. Aldenham.
 **I. yunnanensis*. U. Aldenham, Burnham, Wakehurst 4.
Illicium floridanum. U. Wakehurst† 5.
I. religiosum. K. Wakehurst† 5 ; B. Nymans 4 ; U. Bosahan.
Incarvillea Delavayi. K. Aldersey 6.
I. grandiflora. B. and S. Aldersey 4.
I. grandiflora var. *brevipes*. S. Aldersey ; U. Wisley.
 **Indigofera amblyantha*. U. Kew.
I. Gerardiana. G. Burnham 3 ; B. Wisley 15 ; U. Mangotsfield 6 ; Nymans.
 **I. Kirilowi*. U. Kew.
 **I. pendula*. K. Aldenham ; U. Kew.
Iris bracteata. K. Harrow 3.
 **I. Bulleyana*. U. Wisley.
I. Douglasii. Various forms ; K. and B. Harrow 3-7.
 **I. Forrestii*. U. Wisley.
I. gracilipes. U. Wisley.
I. japonica. B. Harrow (but flowered) ; S. Enfield (under yews, flowered well).
I. Sisyrinchium. K. Wisley ; U. Enfield (sheltered).
I. tenax. K. Harrow (some forms) 5.
I. Wattii. G. Colesborne, Enfield.
Ismene calathina. K. Isleworth.
I. festalis. } K. Isleworth.
I. undulata. }
Isopogon formosus. K. Abbotsbury.
I. latifolius. K. Rostrevor.
Itea ilicifolia. K. Crowsley, Dawyck ; S. Kew (injured 1908-9), Lanarth ; Wakehurst (also U.).
I. virginica. U. Aldenham ; Kew (injured in 1908-9).
Jacobinia floribunda. U. Rostrevor.
Jamesia americana. U. Aldenham.

- *Jasminum Beesianum.* U. Aldenham, Enfield, Wisley.
J. floridum. B. Enfield, Grinstead.
J. frutescens. S. Colesborne.
J. Giraldii. B. Aldenham.
J. officinale. S. Aldenham (also U.).
J. primulinum. K. Carnarvon 4, Crowsley; G. Aldersey†
 Grinstead; B. Crawley 9, Nymans† 6; U. Wakehurst†.
J. revolutum. S. Aldenham.
**J. 11472* Forrest. B. and U. Aldenham.
**J. 6771* Vilmorin. B. Aldenham.
Jubaæa spectabilis. U. Fota.
Juglans boliviensis. U. Rostrevor.
J. cinerea. U.
J. coarctata. U.
J. Duclouxiana. S.
J. mandschurica. U. Aldenham.
J. nigra. U.
J. rupestris. U.
J. sigillata. K.
- Juniperus bermudiana.* K. and G. Wakehurst 2; S. Rostrevor.
J. Cedrus. U. Rostrevor.
J. chinensis. U. Aldenham.
J. japonica. U. Aldenham.
J. fragrans. S. Aldenham.
J. pachyphloea. B. Leonardslee 5; S. Aldenham, Enfield 6.
J. procera. K. Glasnevin, Rostrevor; S. Headfort, Wakehurst 1.
J. virginiana. U. Aldenham.
- *Keleleria Davidiana.* K. Dawyck; S. Wakehurst 3; U. Leonardslee 6, Rostrevor.
K. Fortunei. K. Wakehurst; S. Headfort.
**Kirengeshoma palmata* (Japan). U. Enfield, Ingleborough, Monreith.
Knightia excelsa. U. Ludgvan.
Kniphofia aloides nobilis. K. Harrow 3.
K. caulescens. B. Hever; S. Enfield, Wakehurst.
K. Northiae. K. Wakehurst; B. Stow; S. and U. Enfield.
K. Tuckii. G. Enfield, Northwich (also B.).
Koelreuteria paniculata. S. Aldenham; U. Enfield.
Kolkwitzia amabilis. U. Aldenham.
- Lagerstroemia indica.* G. Stevenage 4; S. Glasnevin; U. Rostrevor.
Lagunaria Patersonii. K. Headfort.
Lambertia formosa. U. Ludgvan.
Lapageria rosea. G. Tal-y-Cafn† N. 6; B. Abbotsbury (also S.)
 Wakehurst† (also S.); S. Bosahan (many lost leaves) 10,
 Nymans† N. 6; U. Rostrevor.
Lardizabala biternata. K. Stevenage; S. Wakehurst†.

- Larix americana*. U. Aldenham.
L. Griffithii. U. Wakehurst 5.
L. kurilensis.
L. occidentalis. } U. Aldenham.
L. sinensis. }
Laurelia serrata. B. Abbotsbury; U. Rostrevor.
Laurus Camphora. K. Headfort; S. Bosahan 8, Fota 10.
L. canariensis. S. Rostrevor.
L. nobilis. K. Byfleet (also G. 5), Guildford 5, Oxon (also G.);
 G. Monmouth 7, Northwich 38, Wye; B. Aldenham (also S.),
 Carnarvon 28, Chipping Norton, Downham 18; S. Enfield
 (leaves browned), Slough 2, Wakehurst; U. Aldersey 10,
 Leonardslee 28 (injured in 1908-9).
Lavandula dentata. K. Headfort.
L. spica. K. Alnwick 12, Wye; B. Aldenham; S. Wisley 4.
L. spica var. *alba*. K. Burnham 2; B. Aldenham, Slough 2.
L. spica var. *Grappenhall*. K. Gatton.
Lavatera assurgentiflora. K. Fota 14.
L. maritima bicolor. K. Enfield 1 and 2, Fota 14; B. Rostrevor (one
 large plant K.).
L. Olbia. K. Glasnevin, Wisley; G. Burnham 2, Enfield 1; B.
 Grinstead.
Leitneria floridana. U. Rostrevor.
Leonotis Leonurus. K. Abbotsbury.
Leptospermum australe. U. Rostrevor.
L. ericoides. K. Headfort; U. Rostrevor.
L. laevigatum. K. Nymans 3; U. Rostrevor.
L. Nairnii. U. Rostrevor.
L. pubescens. U. Rostrevor.
L. scoparium. K. Dorking, Glasnevin, Harrow. 4, Headfort,
 Wisley (and all vars.); S. Wakehurst; U. Carnarvon, Enfield†,
 Fota, Rostrevor.
L. scoparium Boscawenii. K. Carnarvon, Nymans 2, Grinstead; B.
 Lanarth; S. Wakehurst.
L. scoparium Chapmanii. K. Carnarvon 4; K. Llandaff; B. Wake-
 hurst; U. Rostrevor.
L. scoparium Nicholsii. K. Glasnevin, Llandaff; B. Uckfield;
 S. Lanarth; U. Carnarvon, Crawley, Enfield†, Rostrevor,
 Wakehurst.
L. stellatum. U. Rostrevor.
Lespedeza cyrtobotrya. B. Aldenham.
L. Sieboldii. B. Aldenham.
Leucocrinum montanum. K. Monreith 5.
Leucopogon Richei. G. Glasnevin; B. Rostrevor†.
Leucothoe axillaris. U. Aldenham.
L. Catesbaei. S. Aldenham.
Lewisia leana. K. Wisley.
L. Tweedyi. K. Wisley.

- Leycesteria formosa*. G. Monmouth 7; B. Wisley 5-10; S. Aldenham, Enfield 20, Glasnevin.
- Libertia grandiflora*. K. Abbotsbury (also B.); B. Enfield; U. Wakehurst.
- Libocedrus Bidwillii*. S. Wakehurst 1.
- L. chilensis*. K. Dawyck, Glasnevin; U. Rostrevor, Wakehurst.
- L. Doniana*. B. Nymans 15; U. Rostrevor.
- L. macrolepis*. K. Dawyck, Headfort, Wakehurst (also B.); U. Rostrevor.
- Libonia floribunda*. U. Fota.
- Ligustrum angustissimum*. U. Aldenham.
- L. brachystachyum*. U. Aldenham.
- L. Delavayanum*. U. Aldenham, Enfield.
- L. Henryi*. K. Dawyck, Stevenage; B. Glasnevin; S. Aldenham; U. Enfield 2.
- L. Itoa*. U. Aldenham, Enfield.
- L. japonicum*. U. Aldenham.
- L. japonicum* vars. *coriaceum* and *coriaceum revolutum*. U. Aldenham, Enfield.
- L. lucidum*. U. Aldenham.
- L. Massalongianum*. B. Rostrevor.
- L. medium*. U. Aldenham.
- L. Prattii*. U. Burnham.
- L. Quihowi*. S. Aldenham, Enfield.
- L. stronglylphyllum*. S. Aldenham; U. Enfield.
- L. Walkeri*. U. Rostrevor.
- L.* 515A. }
L. 4718 Vilmarin. } U. Aldenham.
L. 6034 Forrest. }
- **Lilium regale*. U. Burnham, Enfield, Monreith.
- **L. Sargentiae*. U. Monreith.
- **L. sutchuense*. U. Monreith.
- Lindera Benzoin*. U. Aldenham.
- L. glauca*. K. Leonardslee 5.
- L. macrophylla*. K. Leonardslee 5; S. Wakehurst 5.
- L. obtusiloba*. S. Wakehurst 4.
- L. praecox*. U. Aldenham.
- L. sericea*. U. Wakehurst 4.
- Linum arboreum*. K. Kew 5-8; U. Enfield 1.
- L. monogynum*. K. Abbotsbury, Enfield.
- Liquidambar styraciflua*. U. Aldenham.
- Liriodendron tulipifera*. U. Aldenham; Chatsworth (many trees 80 years old, split from top to bottom by frost).
- L. chinense*. U. Aldenham.
- Lithospermum intermedium*. K. Harrow 7; S. Enfield.
- L. prostratum*. K. Aldenham, Aldersey (also G.) 3-12, Harrow 7, South Molton 3; G. Abbotsbury, Slough (also B.) 10; B. Stow, Grinstead, Wakehurst (also S.), Wisley 5; S. Mangotsfield.

- Lichospermum prostratum* var. Heavenly Blue. K. Aldenham, Harrow 2.
Litsaea japonica. U. Rostrevor†.
Lomatia ferruginea. K. Abbotsbury; S. Headfort, Wakehurst 8;
 U. Aldenham, Fota, Rostrevor.
L. longifolia. } U. Rostrevor.
L. tinctoria. }
Lonicera alpigena. }
L. coerulea. } U. Aldenham.
L. ciliosa. }
L. reflexicalyx. }
L. Ferdinandii. }
L. flava nova. K. Slough 2.
L. gymnochlamydea. U. Aldenham.
L. Heckrothii. S. Aldenham; U. Enfield.
L. hirsuta. }
L. hispida. }
L. Kesselringii. } U. Aldenham.
L. Kocheana. }
L. Korolkowii. }
L. lancifolia. }
L. Ledebourii. }
L. Maackii. S. Aldenham, Enfield.
L. macrophylla. U. Aldenham.
L. nitida. B. Wisley 6; U. Aldenham; Burnham, Enfield, Mangots-
 field 4, Tortworth 5.
L. pileata. U. Aldenham, Enfield 4, Mangotsfield 4.
L. pyrenaica. U. Aldenham.
L. quinquelocularis. U. Aldenham, Enfield.
L. Ruprechtiana. U. Aldenham.
L. saccata. U. Aldenham.
L. sempervirens. K. Slough 2.
L. spinosa. }
L. Standishii. } U. Aldenham.
L. subdentata. }
L. tartarica. }
L. tibetica. U. Aldenham, Mangotsfield 3.
L. tomentella. U. Aldenham.
L. tragophylla. U. Aldenham.
L. trichopoda. S. Aldenham.
L. trichosantha. U. Aldenham.
L. xerocalyx. U. Aldenham.
L. 269 Farrer. } U. Wisley, Enfield.
L. 372 Farrer. }
Crataegium chinense. K. Aldenham; B. Trebah 18.
Lupinus arboreus. K. Enfield, Slough 2; S. Morton 3, Wisley.
L. chinense. }
L. pallidum. } U. Aldenham.
L. ruthenicum. }

Lycoris squamigera. U. Colesborne, Enfield, Isleworth.

Lysichitum camtschaticense. U. Monreith.

Lysimachia Henryi. B. Grinstead.

Magnolia acuminata. U. Aldenham.

M. Campbellii. K. Crawley 6; U. Wakehurst 10, Westonbirt†.

**M. Delavayi*. K. Tal-y-Cafn† S.W. 5 (older plants leaves injured;
B. Crowsley (in open), Uckfield; S. Dorking 6, Lanarh
Mangotsfield 2, Nymans 2, Wakehurst 6; U. Crowsley†.

M. discolor. K. Stevenage.

M. Fraseri. U. Aldenham.

M. glauca. K. Stevenage; U. Aldenham.

M. hypoleuca. U. Aldenham.

M. Kobus. U. Aldenham, Enfield.

M. macrophylla. G. Glasnevin; S. Uckfield 7.

M. parviflora. U. Aldenham.

**M. salicifolia*. U. Aldenham.

**M. Sargentiana*. U. Burnham, Kew.

M. Soulangeana. U. Aldenham.

M. stellata. K. Exeter; S. Aldenham; U. Enfield.

M. tripetala. U. Aldenham.

M. Watsonii. S. Aldenham.

M. Wilsonii. U. Kew; Wakehurst 3.

Mallotus japonicus. K. Glasnevin.

Malva umbellata. K. Abbotsbury 6.

Malvastrum capense. K. Rostrevor.

Mandevilla suaveolens. K. and G. Tal-y-Cafn† 8; U. Wake-
hurst† 2.

Margyricarpus setosus. K. Aldersey 1-10, Enfield 5, Harrow 4.

Marlea begonifolia. G. Glasnevin; B. Aldenham; W. Wake-
hurst 2.

M. platanifolia. B. Aldenham; U. Wakehurst 2.

Maytenus ilicifolia. U. Rostrevor.

Mazus reptans. S. Enfield; U. Wisley.

Melaleuca armillaris. B. Rostrevor.

M. Beissiana. K. Rostrevor.

M. hypericifolia. K. Rostrevor†.

M. nesophila. K. Rostrevor.

Melia Azedarach. B. Rostrevor.

Melianthus major. G. Enfield (covered with ashes), Wakehurst†.

Meliccytus lanceolatus. B. Leonardslee 4.

M. ramiflorus. U. Rostrevor.

Meliosma Beaniana. U. Aldenham; Kew 4.

M. cuneifolia. U. Aldenham.

M. myriantha. K. Abbotsbury.

M. Oldhamii. U. Kew 9.

M. Veitchiorum. U. Aldenham, Burnham.

- Leimbryanthemum intonsum*. B. Rostrevor.
Leiosideros diffusa. B. Ludgvan, Rostrevor.
L. florida. B. Fota 6.
L. hypericifolia. B. Ludgvan, Rostrevor.
L. lucida. U. Ludgvan, Rostrevor.
L. robusta. U. Ludgvan.
L. tomentosa. B. Lanarth (2 feet high), Ludgvan.
Liarglossa albescens. B. Wisley 4.
Micromeles Folgnieri. U. Aldenham, Burnham.
Samulus glutinosus. B. Rostrevor.
L. glutinosus var. *coccineus*. K. Abbotsbury.
L. varia coccinea. K. Llandaff 2; B. Glasnevin, Wakehurst (also S.), Grinstead; S. Monreith 5, Rostrevor.
Lonicera petrea. K. Stow.
L. nana bipinnata. K. Abbotsbury.
L. iridioides var. *Mackayi*. B. Rostrevor.
L. nigra. S. Aldenham.
L. alba. U. Aldenham.
Lachenbeckia complexa. K. Aldersey (also G.) 1-10, Colesborne, Slough 2; G. Exeter 8, Enfield 15, Lanarth; B. Aldenham, Stow, Wisley; U. Kew (G. in 1908-9).
L. varians. G. Enfield 20; B. Wisley 6.
Lasa Basjoo. U. Rostrevor, Uckfield.
Latisia Clematis. B. Rostrevor.
L. decurrens. S. Rostrevor.
L. ilicifolia. U. Rostrevor.
Lycopodium acuminatum. B. Rostrevor.
L. lactum. K. Enfield† 3, Rostrevor; B. Abbotsbury; S. Bosahan.
L. asplenifolia. U. Aldenham.
L. californica. K. Dawyck; B. Glasnevin.
L. crispa. B. Rostrevor; U. Aldenham.
L. grisea africana. K. Glasnevin; U. Rostrevor.
L. salicina. B. Rostrevor.
L. semiserrata. K. Glasnevin; B. Rostrevor.
L. Urvillei. K. Glasnevin, Nymans 3; G. Fota 4; S. Rostrevor.
Lyris bullata. K. Nymans 3; G. Wakehurst 1; S. Rostrevor; U. Ludgvan.
L. communis. G. Ashford, Dorking 20, Romford 10, Tortworth 15; B. Glasnevin, Kew†, Osterley, Wakehurst†, Grinstead; S. Headfort, Nymans 10; U. Bosahan.
L. communis var. *boetica*. S. Rostrevor.
L. communis var. *tarentina*. B. Kew†, Enfield, Grinstead.
L. Luma (apiculata). K. Wakehurst (also G.†) 3; G. Guildford 10, Tal-y-Cafn† 2-10 (also B.), Uckfield; B. Glasnevin, Headfort, Lanarth 12, Nymans 8.
L. obcordata. K. Aldenham, Crawley 5; G. Wakehurst 1; S. Rostrevor.

Myrtus Ugni. K. Tal-y-Cafn† (2-10); ‡ also G. Glasnevin; S. Lanarth 12, Nymans† 8.

Nandina domestica. B. Slough 5; S. Aldersey†, Enfield (shaded leaves) 15; U. Aldenham, Fota.

Neillia longeracemosa.

N. opulifolia.

N. sinensis.

N. Torreyi.

Nemopanthus canadensis.

Nerine species and vars. K. Isleworth†.

Nertera depressa. U. Rostrevor.

Nesaea salicifolia. B. Aldenham, Rostrevor, Wakehurst 2, Enfield.

Nierembergia frutescens. K. Enfield 3, Rostrevor, Wisley.

Notelaea excelsa. B. Wakehurst 1.

Nothofagus antarctica. U. Aldenham, Rostrevor.

N. betuloides. U. Rostrevor.

N. Cliffortioides. S. Glasnevin, Rostrevor, Wakehurst 10.

N. Cunninghamii. K. Abbotsbury (young plants); B. Nymans; Wakehurst 5; U. Rostrevor.

N. fusca. S. Wakehurst; U. Rostrevor.

N. Menziesii. B. Leonardslee 5, Wakehurst 5; U. Rostrevor.

N. obliqua. U. Aldenham (young plants B.); U. Leonardslee; Rostrevor, Tortworth 2.

N. procera. K. Glasnevin; U. Aldenham (also S.), Leonardslee 4, Rostrevor.

N. Solandri. G. Wakehurst; B. Nymans 3.

Nothopanax arboreum. B. Rostrevor.

Notospartium Carmichaeliae. K. Wisley; S. Aldenham; U. Llandaff, Rostrevor, Wakehurst.

Oenothera ovata. K. Harrow 1; Wisley.

Olea arborea. U. Rostrevor.

O. europaea. B. Kew† S., Nymans 8; U. Bosahan, Rostrevor.

O. fragrans. S. Wakehurst 7.

Olearia angustifolia. K. Ludgvan, Rostrevor.

O. argophylla. K. Headfort, Wakehurst (also G.); S. Leonardslee 10, Rostrevor; U. Bosahan 10. (The only *Olearia* injured at Abbotsbury.)

O. argophylla × *macrodonia* (?). Self-sown, S. Bosahan.

O. avicenniaefolia. S. Glasnevin, Wakehurst 5.

O. chathamica. K. Rostrevor; B. Poolewe; U. Ludgvan.

O. Colensoi. U. Ludgvan.

O. dentata. K. Glasnevin; G. Dorking 20; B. Trebah, 9.

O. Fosteri. K. Stevenage 7; G. Glasnevin, Leonardslee 20; B. Wakehurst† 4; S. Nymans† 8.

O. furfuracea. U. Wakehurst 3.

O. Haastii. K. Aylesbury (also B.) 25, Byfleet (also G.); 6

- Chipping Norton 16, Dorking 20, Monmouth 25; B. Downham, Wisley; U. Aldenham (K. in 1908-9), Aldersey, Enfield 15 (G. in 1908-9), Nymans 8.
- Paria ilicifolia*. K. Mangotsfield 2; B. Aldenham; S. Glasnevin.
- P. insignis*. K. Llandaff; B. Enfield, Glasnevin; S. Lanarth, Woodbridge; U. Rostrevor.
- P. macrodonta*. K. Aldenham, Aldersey 8, Wisley 10; G. Enfield, Stow 5; B. Glasnevin, Grinstead, Mangotsfield 5; South Molton 6; S. Harrow, Nymans (also U.); U. Wakehurst.
- P. moschata*. K. Nymans 3; U. Colesborne; Enfield.
- P. myrsinoides*. B. Glasnevin; S. Nymans 3.
- P. nitida*. B. Glasnevin, Headfort, Llandaff 2; S. Wakehurst, Nymans (also U.).
- P. cumularifolia*. U. Aldenham, Colesborne, Enfield 15.
- P. pannosa*. U. Ludgvan.
- P. ramulosa*. K. Ludgvan, Rostrevor.
- P. semidentata*. K. Leonardslee† 3 (also U.), Llandaff, Wakehurst 1; U. Lanarth, Ludgvan, Rostrevor.
- P. Selandri*. K. Enfield 6, Glasnevin.
- P. stellulata* (of gardens). K. Aldenham (also G.), Aldersey 8, Ashford, Colesborne, Exeter 14, Llandaff, South Molton (also B.), Stevenage 4, Stow 6, Tortworth (also B.) 5; G. Cobham 3, Woodbridge; B. Chipping Norton 4, Epping 5, Harrow 6, Wakehurst, Wisley 6; U. Enfield (plants pruned in after flowering the preceding summer), Nymans.
- P. Traversii*. K. Llandaff; S. Glasnevin.
- P. virgata*. B. Wisley 5; U. Enfield 10.
- P. virgata* var. *linifolia*. U. Enfield 10.
- P. hirsuta arragonensis*. U. Aldenham, Enfield.
- P. fruticosa*.
P. hirsuta.
P. rotundifolia. } U. Aldenham, Enfield.
- P. sma albo-roseum*. K. Wisley 4; U. Enfield (dry under conifers) 3-4.
- P. antias*. K. Grinstead.
- P. nixa japonica*. U. Aldenham.
- P. leucanthus Aquifolium*. U. Aldenham.
- O. armatus*. U. Aldenham, Leonardslee.
- O. Delavayi*. U. Aldenham, Enfield 6, Lanarth, Mangotsfield, Tal-y-Cafn, Tortworth 5.
- O. 4109 Vilmorin*. U. Aldenham (some S.).
- Osmondes anthyllidifolia*. K. Lanarth, Stevenage; B. Aldenham, Leonardslee 4, Wakehurst† 6; S. Crowsley.
- O. subrotunda*. B. Wakehurst† 2.
- O. nixa carpiniifolia*.
O. virginica.
O. nixa japonica. } U. Aldenham.
- O. nixa magellanica*. U. Enfield 2, Wisley.
- P. coccus macrocarpus*. S. Aldenham.

- Paederia tomentosa* (435 Wilson). B. Aldenham.
**Paeonia Cambessedesii* (Corsica). } U. Colesborne.
P. cretica. }
P. lutea. U. Aldenham, Enfield.
P. Mlokošewitschii. U. Colesborne, Enfield.
Paliurus aculeatus. S. Aldenham.
Panax arboreum. S. Wakehurst 3; U. Rostrevor.
P. Colensoi. U. Rostrevor.
P. diversifolium. U. Aldenham.
**Pancratium illyricum*. U. Isleworth.
P. maritimum. K. Isleworth.
Parrotia Jacquemontiana. } U. Aldenham.
P. japonica. }
Parsonia albiflora. S. Wakehurst† 3; U. Rostrevor.
**Pasilthea caerulea*. U. Colesborne†.
Passiflora caerulea. K. Slough 1; G. Nymans† 6; B. Headfort,
 Lyndhurst† N.
P. caerulea Constance Elliott. K. Enfield† 7.
**Patrinia palmata*. U. Monreith.
**Paulownia DuRoi*. S. Leonardslee; U. Westonbirt.
**P. Fargesii*. U. Westonbirt.
P. tomentosa lanata. K. young Aldenham (also U. 9 years old);
 U. Colesborne, Enfield 2, Tortworth 5.
Pelargonium Endlicherianum. S. Wakehurst 5.
Pentaptygium rugosum. B. Wakehurst† 2; U. Ludgvan.
P. serpens. G. Leonardslee† 4.
Pentstemon cordifolius. G. Glasnevin; B. Headfort; U. Rostrevor†,
 Wakehurst†.
P. isophyllus. K. Harrow 2; S. Enfield 3.
P. Myddelton, Newbury and Southgate Gem. K. Slough 4; B. Enfield.
Peraphyllum ramosissimum. U. Aldenham.
Pernettya mucronata. G. Wisley 12; B. Monmouth 7; S. Harrow 15;
 Nymans 10; U. Aldenham.
Perovskia atriplicifolia. G. Slough; B. Aldenham, Lanarth.
 Wisley; S. Enfield 10, Glasnevin; U. Aldersey 10, Mangots-
 field 4.
Petteria ramentacea. U. Aldenham.
Peumus Boldus. B. Rostrevor.
Phaedranassa Carmiolii. K. Isleworth.
Phellodendron amurense. } U. Aldenham.
P. amurense × *japonicum*. }
P. sachalinense. U. Aldenham, Tortworth 1.
Philadelphus Coulteri. G. Glasnevin.
**P. Delavayi*. U. Burnham.
P. Lemoinei. U. Aldenham and all of the Genus.
P. roseus. G. Glasnevin.
P. uniflorus. G. Glasnevin.

- Alsea buxifolia*. B. Stow 2; U. Rostrevor.
Allyrea angustifolia. S. Aldenham.
angustifolia rosmarinifolia. S. Aldenham.
decora.
latifolia. } U. Aldenham.
media. }
Elecladus alpinus. U. Ludgvan.
Emmis cashmeriana. S. Grinstead.
fruticosa. K. Aldenham 1; K. Aldersey (also B.) 5-12;
 Crowsley 9, Enfield 10, Glasnevin; B. Monreith 15, Wisley
 12; S. Wakehurst.
Emmis canariensis. K. Fota 4; U. Bosahan.
senegalensis. S. Fota.
Ermium Colensoi. B. Glasnevin, Headfort.
Hookianum. G. Enfield (one plant; others U.), Wisley 5.
Lenax. K. Aldersey (also B.) 2-10, Hitchin 4, Stow; G. Wisley
 20; B. Headfort, South Molton 3; S. Enfield 7, Leonardslee 16
 (injured 1908-9), Uckfield, Wakehurst.
Lenax var. *atropurpureum*. G. Glasnevin; B. Enfield.
Linna. All species grown at Glasnevin B.
Benthamiana. K. Glasnevin.
Davidsoniae. B. Aldenham (also S.), Glasnevin, Kew 10.
serrulata. S. Aldenham, Enfield 8, Mangotsfield 4, Slough
 6; U. Wakehurst (old).
serrulata var. *rotundifolia*. K. Glasnevin; B. Wakehurst.
villosa. U. Wakehurst.
Elecladus rhomboidalis. K. Nymans 6.
Trichomanoides. U. Rostrevor; Wakehurst 2.
Phyllostachys aurea. G. Abbotsbury 10; S. Aldenham, Enfield 20.
fastuosa. B. Aldenham; S. Enfield (only young canes hurt).
nodularia. U. Aldenham.
viridi-glaucescens. G. Northwich; B. Oxon; U. Aldenham,
 Kew (G. in 1908-9); Enfield.
Picea asperata. }
P. Balfouriana. } U. Leonardslee.
brachytyla. U. Aldenham.
complanata. }
Koyamai. } U. Leonardslee.
montigena. }
P. purpurea. }
P. retroflexa. } U. Leonardslee.
rubra. U. Aldenham.
Sargentiana. U. Leonardslee.
Pterasma quassoides. U. Aldenham.
Pieris formosa. G. Wisley 12; S. Lanarth.
japonica. U. Aldenham.
ovalifolia. S. Wakehurst 1.
Pimelea laevigata. S. Wakehurst 3.

- Pimelea longiflora*. U. Rostrevor.
P. longifolia. U. Ludgvan.
Pinus aristata. U. Aldenham.
P. Armandi. K. Dawyck ; S. Headfort ; U. Wakehurst 10.
P. Ayacahuite. K. Glasnevin ; U. Wakehurst 10.
P. Brutia. B. Glasnevin.
P. canariensis. K. Headfort ; Leonardslee 3 ; U. Rostrevor.
P. cembroides. S. Glasnevin.
**P. densata*. U. Leonardslee.
P. densiflora. B. Headfort.
P. flexilis. U. Aldenham.
P. Greggii. K. Leonardslee 6.
P. halepensis. K. Headfort, Leonardslee 5, Wisley ; B. Colborne (seed from Andalusia), Wakehurst 4.
P. Hartwegii. S. Wakehurst 6.
P. insignis. B. Lanarth (where exposed to E.), South Molton ; S. Slough 3.
P. Lambertiana. S. Headfort.
P. leucodermis. U. Aldenham.
P. Lindleyana. K. Romford 6.
P. longifolia. K. Leonardslee 3, Rostrevor.
P. Lumholtzii. K. Fota 7.
P. mitis. K. Glasnevin.
P. montana. U. Aldenham.
P. Montezumae. K. Leonardslee 8 ; S. Glasnevin.
P. osteosperma. K. Headfort.
P. patula. K. Leonardslee 5 ; B. Glasnevin, Wakehurst 4 ; Headfort ; U. Rostrevor.
P. Pseudo-strobus. K. Fota ; S. Headfort, Leonardslee 5.
P. Taeda. S. and U. Wakehurst 4.
P. Teocote. K. Fota (young).
**P. Wilsonii*. U. Leonardslee.
**P. yunnanensis*. K. Dawyck ; U. Leonardslee.
Piptanthus concolor. B. Aldenham.
P. nepalensis. K. Aldersey 8, Dawyck (nearly all) ; G. Wisl 2-7 ; B. Mangotsfield 4 ; S. Enfield 7.
Pistacia atlantica. K. Leonardslee† 2 ; B. Rostrevor.
P. Lentiscus. G. Leonardslee† 6 ; S. Rostrevor.
Pitcairnea caerulea. U. Rostrevor.
P. spathacea. U. Rostrevor.
Pittosporum bicolor. K. Abbotsbury ; B. Wakehurst 3.
P. Buchananii. G. Enfield (open) ; S. Aldenham, Enfield†.
P. Colensoi. B. Grinstead, Harrow 5, Uckfield 6.
P. coriaceum. K. Glasnevin ; S. Rostrevor.
P. crassifolium. K. Fota 3, Wakehurst 6.
P. Dallii. U. Ludgvan.
P. eugeniioides. K. Ashford, Glasnevin ; K. Uckfield (also B)‡ ; U. Bosahan 20.

- Pilosporum eugenioides variegatum*. K. Abbotsbury, Aldenham.
P. Fairchildii. K. Glasnevin.
P. flavum. K. Abbotsbury.
P. Myri. K. Aldenham 20, Ashford, Glasnevin, Llandaff 2
 B. Lanarth; S. Sherborne 6, Uckfield 7; U. Bosahan 20.
P. patulum. U. Ludgvan, Rostrevor.
P. rhomboideum. K. Abbotsbury.
P. tenuifolium. K. Aldenham (old plants B.), Headfort, Stevenage
 4; B. Uckfield 6, Wakehurst 5.
P. Tobira. K. Aldenham (also B.†), Grinstead; B. Mangotsfield 3;
 S. Enfield 4 (K. in 1908-9).
P. umbellatum. B. Ludgvan.
P. undulatum. K. Lanarth, Headfort, Wisley 4-6; B. Glasnevin;
 Ludgvan, Nymans 6.
Pagianthus divaricatus. U. Fota.
P. palchellus. K. Abbotsbury, Headfort; G. Glasnevin.
Pagiospermum sinense. K. Dawyck.
P. canus acerifolia. K. Dawyck. All branches up to 15 feet B.
P. occidentalis. } U. Aldenham.
P. racemosa. }
Plumbago capensis. B. Rostrevor†.
Polycarpus acutifolia. G. Leonardslee 3.
P. andina. B. Abbotsbury.
P. chilina. B. Abbotsbury; S. Uckfield 7.
P. dactyloides. G. Leonardslee 4.
P. elongata. S. Rostrevor.
P. ferruginea. K. Leonardslee 2.
P. Hallii. R. Glasnevin.
P. koreana. U. Aldenham.
P. latifolia. K. Leonardslee 3.
P. microphylla. B. Leonardslee 6, Wakehurst (also U.) 3.
P. spicata. B. Wakehurst 2.
P. Tolara. B. Glasnevin; S. Exeter 5, Wakehurst (also U.) 4.
Ponilia platensis. U. Colesborne†.
Poinciana Gilliesii. K. Fota† 5; S. Wakehurst† 8.
P. regia. K. Abbotsbury.
Polystyris sinensis. U. Aldenham, Wakehurst 3.
Polygala myrtifolia. K. Headfort.
Polypodium Billardieri. B. Rostrevor†.
Pomaderris apetala. K. Nymans 3; B. Rostrevor.
Populus certinensis. } U. Aldenham.
P. generosa. }
P. lasiocarpa. U. Aldenham, Burnham.
P. sinensis. U. Aldenham.
P. szechuanica. K. Aldenham (also B. and S.); U. Kew 4.
P. trichocarpa. U. Aldenham, Enfield.
P. Wislizenii. U. Aldenham.
P. yunnanensis. U. Leonardslee, Tortworth 1.

**Potentilla Vilmoriniana*. S. Rostrevor; U. Aldenham, and all the genus.

**Primula Loczii* (Farrer 40). U. Enfield 1, Wisley 2.

**P. Winteri*. U. Wisley.

Prinsepia sinensis. U. Aldenham.

Prostanthera lasianthos. K. Abbotsbury 10; U. Rostrevor.

P. rotundifolia. K. Ashford, Wakehurst†.

P. violacea. S. Rostrevor.

Proustia pyrifolia. B. Rostrevor (recovered well).

Prumnopitys elegans. K. Dawyck; U. Aldenham.

Prunus alleghaniensis.

P. americana. } U. Aldenham.

P. canescens. }

P. caroliniana. B. Rostrevor.

P. Conradinae.

P. Cuthbertii.

P. demissa.

P. emarginata. } U. Aldenham.

P. glandulosa.

P. hortulana.

P. ilicifolia. K. Tortworth 4; B. Aldenham.

P. Lauro-cerasus. G. Chatsworth; B. Aylesbury 40, Lanarth, Oxon;
S. Chipping Norton (worse in 1908-9), Downham; U. Aldenham (some S.).

P. Lauro-cerasus caucasica. S. Slough 3; U. Aldenham.

P. Lauro-cerasus latifolia. } U. Aldenham.

P. Lauro-cerasus pygmaea. }

P. Lauro-cerasus schipkaensis. } U. Aldenham, Enfield.

P. Lauro-cerasus Zabeliana. }

P. lusitanica. B. Aldenham (exposed to E.); S. Aldenham.

P. lusitanica azorica. U. Aldenham.

P. lusitanica myrtifolia. B. Monmouth 7; S. Oxon; U. Aldenham.

P. mandschurica.

P. maritima. } U. Aldenham.

P. melanocarpa. }

**P. mira*. B. Glasnevin; U. Aldenham, Wisley.

P. Mume.

P. orthosepala. } U. Aldenham.

P. Potaninii. }

P. pubigera.

P. pumila. G. Glasnevin; U. Aldenham.

P. Riverchonii.

P. rufa.

P. rufomicans.

P. salicina. } U. Aldenham.

P. Sargentii.

P. serrulata.

P. subhirtella.

- Prunus tenuiflora*. U. Aldenham.
**P. thibetica*. U. Aldenham, Burnham.
P. lomentosa. } U. Aldenham.
P. Wilsoni. }
P. 241 Wilson. S. Aldenham.
Pseudopanax chatamicum. U. Ludgvan.
P. crassifolium. U. Ludgvan, Rostrevor.
P. ferox. B. Leonardslee 3; S. Wakehurst; U. Rostrevor.
P. Lessonii. B. Rostrevor.
Pseudotsuga chinensis. K. Dawyck.
P. japonica. U. Aldenham.
Psoralea humulata. K. Trebah (also B.).
Peris serrulata. B. Rostrevor.
Pterocarya caucasica. U. Aldenham.
**P. hypohensis*. U. Kew 9.
P. rhoifolia. } U. Aldenham.
P. stenoptera. }
Pteroceltis Davidiana. S. Aldenham.
P. Talarinovi (268 Wilson). B. Aldenham.
P. Wilsonii. B. Colesborne.
Pueraria japonica. K. Nymans† W. 6.
Punica Granatum. S. Glasnevin; U. Rostrevor†.
Purshia tridentata. S. Aldenham.
Pyra chilensis. U. Rostrevor.
Pyracantha angustifolia. B. Glasnevin, Wisley 6; S. Enfield 7;
 U. Nymans.
P. crenulata. K. Dawyck.
P. Gibbsii. U. Aldenham.
P. Rodgersiana. S. Aldenham.
P. 5804 Forrest. K. Aldenham.
Pyrus americana.
P. astracanica.
P. caloneura.
P. Cashmere crab.
P. chinensis.
P. coronaria.
P. cuspidata.
P. domestica.
P. clavigrifolia.
P. floribunda.
P. glaucescens.
P. Goudardii.
P. hybrida.
P. intermedia.
P. iensis.
P. latifolia.
P. Matsumurana.
P. Maximowiczii.

U. Aldenham.

- Pyrus munda subbrachnoides.*
P. orthocarpa.
P. Parkmanni.
P. Pashia.
- } U. Aldenham.
- *P. pekinensis.* U. Aldenham, Leonardslee.
P. pinnatifida.
P. Prattii.
P. Ringo.
P. (Malus) Sargentii.
P. (Sorbus) Sargentiana.
P. sikkimensis.
P. spectabilis.
P. sphaerocarpa.
P. tianschanica.
P. Toringo.
- } U. Aldenham.
- P. transitoria-toringoides.*
P. Tschonoskii.
P. utahensis.
P. Veitchii.
P. vestita.
P. Vilmoriniana.
P. yunnanensis.
P. Zumi.
P. 8924 Forrest.

- Quercus acuta* (?) from Sikkim. G. Colesborne.
Q. acuta bambusaefolia.
Q. acutifolia.
- } U. Aldenham.
- Q. Aegilops* (Valonia Oak). U. Colesborne 6.
Q. agrifolia. S. Rostrevor.
Q. alnifolia. B. Leonardslee 6; U. Rostrevor.
**Q. aquifolioides.* S. Kew 9.
Q. californica.
Q. castaneaefolia.
- } U. Aldenham.
- Q. chrysolepis.* U. Rostrevor.
**Q. cleistocarpa.* S. Kew 9.
Q. conferta. U. Aldenham.
Q. dealbata. K. Wakehurst 5.
Q. densiflora. U. Aldenham, Rostrevor.
Q. dentata. U. Aldenham.
**Q. Engleriana.* U. Kew 9.
Q. falcata. U. Aldenham.
Q. Fragnus. B. Aldenham.
**Q. Gilliana.* U. Kew 9.
Q. glabra. U. Aldenham.
Q. glandulifera. S. Glasnevin.
**Q. Henryi.* S. Kew 9.

- Quercus Ilex.* B. Aylesbury 40; Northwich (lost all leaves); S. Newbury; U. Aldenham.
- Q. incana.* U. Rostrevor.
- Q. Libani.* U. Aldenham.
- Q. Lucombeana.* S. Chipping Norton 50 (lost all leaves); U. Aldenham.
- Q. Lusitanica.* }
- Q. macrodonica.* } S. and U. Aldenham.
- Q. Mirbeckii.* }
- Q. nana.* }
- Q. nigra.* B. Leonardslee 5; U. Wakehurst 2.
- Q. O'Brayeana.* G. Colesborne.
- *Q. oxyodon.* U. Kew 9.
- Q. pubustris.* }
- Q. Phellos.* } U. Aldenham.
- Q. pubica.* }
- Q. prinoides.* }
- Q. serrata.* }
- Q. sphaculata.* S. Glasnevin.
- Q. Suber.* B. Oxon, Rostrevor, Wakehurst 2; S. Glasnevin; U. Bosahan.
- Q. Tora.* }
- Q. velutina.* } U. Aldenham.
- Quillaja Saponaria.* S. Nymans† 6.
- Ranunculus australis.* K. Stow; S. Enfield; U. Monreith, Wisley.
- R. glabra.* B. Harrow; U. Enfield, Wisley.
- R. sabiceana.* U. Enfield, Wisley.
- Raphiolepis Delacouri.* B. Aldenham; S. Kew 5, Wakehurst 6.
- R. indica.* B. Aldenham, Wakehurst 5.
- R. japonica.* U. Aldenham.
- R. ovata.* K. Colesborne, Headfort; G. Burnham 3; U. Enfield.
- Raspberry canes. K. Ross-shire (not known before).
- Rosio subverticillata.* S. Rostrevor 9 (recovering slowly).
- Rubus idaeus Solandri.* K. Enfield† 1; Rostrevor.
- Rhamnus Alaternus.* K. Headfort; B. and S. Aldenham.
- R. Alaternus* var. *angustifolia.* S. Aldenham.
- R. Alaternus* var. *Pereiri.* K. Harrow 3; S. Enfield.
- R. californica.* }
- R. dahurica.* } U. Aldenham.
- R. erythroxylon.* }
- R. hybrida Billardii.* }
- R. Flanotica.* }
- Rubus idaeus cyanocarpus.* G. Uckfield 3; B. Lanarth, Leonardslee 4; S. Nymans† W. 6.
- Rhododendron.* All Chinese species at Tortworth uninjured except *R. lutescens*; all Wilson's and Forrest's uninjured at Lanarth; all large-leaved Chinese uninjured at Dawyck.

- Rhododendron Albrechtii*. K. Dawyck.
R. adenogynum. U. Kew.
R. arboreum vars. K. Wisley (also B.) 4; S. Tal-y-Cafn.
R. argenteum. K. Dawyck; S. Tal-y-Cafn.
R. argyrophyllum. B. Dawyck.
R. argyrophyllum var. *cupulare*. B. Dawyck.
R. assamicum. K. Wakehurst 1.
R. Auchlandi. K. Tal-y-Cafn (also B.).
R. Auchlandi, hybrids of. U. Bergholt.
**R. Augustinii*. K. Dawyck; U. Tal-y-Cafn.
**R. auriculatum*. U. Tal-y-Cafn.
**R. bullatum*. K. Leonardslee 3, Wakehurst 2, Kew; G. Bergholt.
**R. cephalanthum*. U. Kew.
R. chartophyllum. B. Dawyck.
R. ciliatum. G. Tal-y-Cafn (also B. and S.), Wisley 3; B. Dawyck.
R. ciliicalyx. K. Rostrevor.
R. × Cornubia. U. Tal-y-Cafn.
**R. colophyton*. U. Tal-y-Cafn.
**R. coreanum* (not Chinese). U. Kew.
**R. crassum*. K. Dawyck; B. Kew.
**R. Cuthbertii* (not Chinese). B. and K. Kew.
**R. cyanocarpum*. U. Kew.
R. Dalhousiae. U. Rostrevor.
**R. Delavayi*. B. Dawyck; S. Kew.
R. dilatatum. K. Dawyck.
**R. discolor*. U. Tal-y-Cafn.
R. Edgeworthii. U. Rostrevor.
R. Edgeworthii × *Countess of Haddington*. U. Tal-y-Cafn† N.
R. Falconeri. K. Wisley 3.
**R. Fargesii*. U. Tal-y-Cafn.
R. floribundum. B. Dawyck.
R. fragrantissimum (*formosum* × *Edgeworthii*). U. Tal-y-Cafn† N.
R. fulvum. U. Kew.
R. glaucum. B. Dawyck.
**R. haematodes*. U. Kew.
**R. Harrovianum*. K. Dawyck.
**R. hippophaefolium*. U. Kew.
R. Hodgsonii. U. Dawyck.
R. hypoglaucum. K. Dawyck.
R. indicum Hinodegeri. S. Nymans 3.
**R. insigne*. -U. Kew.
**R. intricatum*. B. Stow; U. Tal-y-Cafn, Wisley.
R. irroratum. K. Dawyck.
R. Kaempferi. B. Dawyck.
R. Keysii. K. Dawyck.
R. lacteum. B. Dawyck.
R. linearifolium. U. Wakehurst 5.
**R. lutescens*. S. Tortworth; U. Tal-y-Cafn 5.

- Rhododendron Maddenii*. G. Tal-y-Cafn.
 **R. Metternichii*. K. Dawyck.
R. micranthum. B. Dawyck.
 **R. ovatum*. B. Kew 5.
 **R. creodora*. U. Tal-y-Cafn.
 **R. creotrephe*. U. Kew.
 **R. oxyphyllum*. K. Rostrevor ; Tal-y-Cafn.
 **R. polifolium*. U. Kew.
 **R. polylepis*. B. Dawyck.
R. ponticum. B. Northwich 38.
 **R. Pratii*. U. Kew.
 **R. prostratum*. U. Kew.
R. racemosum. S. Stow ; U. Mangotsfield 2, Wisley.
 **R. rhombicum*. K. Dawyck.
 **R. Sargentianum*. U. Kew.
R. x Sesterianum (ciliatum \times Edgeworthii). S. Nymans 4.
 **R. sino-grande*. U. Lanarth.
 **R. Souliei*. K. Nymans ; U. Tal-y-Cafn.
R. sublaeolatum. B. Glasnevin, Nymans 3.
 **R. taliense*. B. Dawyck.
 **R. Traillianum*. U. Kew.
 **R. trichocladum*. U. Kew.
R. triflorum. U. Wakehurst 10.
 **R. villosum*. B. Dawyck.
 **R. Watsoni*. K. Dawyck.
 **R. Williamsianum*. U. Kew.
 **R. Williamsonii*. U. Tal-y-Cafn.
R. Wilsonii. U. Wisley.
 **R. yunnanense*. B. Dawyck.
 **R. 6181 F.* B. and K. Tal-y-Cafn ; U. East Bergholt.
Rhodostachys andina. S. Enfield (covered).
R. argentina. S. Enfield (flowered 1917, covered).
R. pilcairniaefolia. B. Enfield (covered), Lanarth ; U. Rostrevor.
Rhus ailanthoides. U. Aldenham.
R. copallina. U. Aldenham.
R. corallina. } U. Aldenham.
R. Coraria. }
R. cotinoides. S. and U. Aldenham ; U. Enfield.
R. Cotinus. S. Aldenham ; U. Enfield.
R. integrifolia. K. Rostrevor.
R. Osbeckii. K. Monreith 5 ; U. Aldenham.
R. semialata. U. Aldenham, Enfield 6.
R. vernicifera. U. Aldenham, Enfield 8.
Ribes alpinum.
R. americanum. } U. Aldenham.
R. amictum. }
R. Carrierei. }
R. chilense. U. Aldenham ; K. Dawyck.

Ribes cruentum. U. Aldenham, Mangotsfield 2.

R. Culverwellii.
R. diacanthum.
R. divaricatum.
R. floridum.
R. glaciale.
R. glutinosum. } U. Aldenham.

R. himalayense.
R. laurifolium. U. Aldenham; Enfield 1; Wakehurst 2.

R. leptanthum.
R. Muximowiczii.
R. mogollonicum.
R. montanum.
R. pinetorum.
R. Pringlei.
R. prostratum.
R. Spaethianum. } U. Aldenham.

R. speciosum. U. Aldenham; K. Dawyck; G. Wisley 8; B. Stevenage;
 S. Aldenham, Wakehurst† 12; U. Aldersey† 6-12, Enfield;
 Mangotsfield 2.

R. stenocarpum.
R. stenophyllum.
R. subvestitum.
R. tenue.
R. tenuifolium.
R. urceolatum. } U. Aldenham.

R. viburnifolium. U. Aldenham; K. Wakehurst† 1.

R. Warscewiczii. U. Aldenham.

Richardia africana. K. and B. Isleworth, Wisley.

Robinia Decaisneana.
R. hispida.
R. Kelseyi.
R. neo-mexicana. } U. Aldenham.

Romneya Coulteri. G. Aldenham, Enfield, Wakehurst†; B. Dording
 10, Exeter 11, Harrow 6, Lanarth, Rostrevor; S. Guildford 11;
 U. Mangotsfield 3.

R. trichocalyx. K. Aldersey 15 (also G.); G. Enfield 8, Wakehurst 2;
 B. Rostrevor.

Rosa anemonaeiflora. B. Aldenham.

R. Arnoldiana. U. Aldenham.

R. Banksiae. S. Wakehurst† 10.

R. bracteata. K. Wakehurst† (also G.); B. Enfield 8, Grinstead; S.
 Nymans† 6; U. Cobham 13 (B. in 1908-9), Mangotsfield 5.

**R. Chinese new species*. U. All at Kew.

Roses, Garden vars.:

Teas. K. Byfleet (if not planted deep enough); G. Northwick
 Newbury; B. Downham, Slough.

Hyb. teas. K. Oxon; G. Edenhall Monmouth, Northwick
 B. Slough.

• *Roses, Garden vars.*

H. Ps. K. Oxon; G. Edenhall; S. Byfleet; U. Monmouth.
Ramblers and Climbers. K. Oxon (many); G. Byfleet, Edenhall, Northwich.

China. G. Chatsworth.

Rosa glomerata. }
R. Kellers. } U. Aldenham.
R. longicuspis. }

**R. Moyesii.* U. Aldenham, Enfield.

**R. omciensis.* U. Aldenham, Burnham, Enfield.

R. Pratii. } U. Aldenham.
R. prostrata. }

R. Soulieana. S. Aldenham.

R. Wichuraiana Jersey Beauty. B. Aldenham; U. Enfield, Wisley.

**R.* 291. Farrer. U. Aldenham, Enfield.

**R.* 1306. Wilson. S. Aldenham.

**R.* 10,843. Forrest. U. Aldenham.

Rosmarinus officinalis. K. Alnwick 12, Headfort, Kew, S. Molten 7; B. Aldenham, Aldersey, Colesborne, Slough 3, Wisley 5; S. Wakehurst.

R. officinalis prostratus. K. Grinstead, Slough 2, Stow, Wakehurst 4.

**Rubus bambusarum.* K. Glasnevin; U. Enfield.

R. biflorus. U. Aldenham, Enfield.

R. cissoides pauperatus. K. Wisley 3; B. Mangotsfield 3, Glasnevin, Grinstead; S. Enfield 20 (exposed); U. Enfield† 7.

R. chirosepalus. K. Dawyck.

R. deliciosus. U. Aldenham, Enfield.

**R. flagelliformis.* B. Aldenham; S. Enfield.

R. frendosus. U. Aldenham.

**R. Henryi.* B. Aldenham.

R. ichangensis. B. Aldenham; G. Glasnevin.

R. incisus. U. Aldenham.

R. innominatus. U. Aldenham.

**R. irenaeus.* B. Aldenham.

R. Lambertianus. B. and S. Aldenham.

R. mesogaeus. B. Aldenham.

R. Parkeri. B. Aldenham, Glasnevin.

**R. polytrichus.* }
R. pubescens. } B. Aldenham.

R. thyrsoides. }
R. villosus. } U. Aldenham.

Salix Bockii. K. Dawyck; U. Aldenham, Enfield.

**S. hypoleuca.* U. Kew 4.

**S. magnifica.* U. Aldenham; Kew 8; Leonardslee; Mangotsfield.

**S. myrsinensis.* U. Kew 4.

Salvia aurea. B. Rostrevor.

S. Candelabrum. K. Enfield 7, Wisley; B. Harrow 5, Grinstead

- Salvia Grahamii*. K. Enfield 2, Glasnevin, Kew, Llandaff 1, Wisley; G. Enfield 7; B. Mangotsfield 1; Rostrevor.
- S. interrupta*. S. Harrow.
- S. prostrata*. S. Grinstead.
- S. uliginosa*. K. Enfield 2, Kew (when exposed); B. Slough 2; U. Enfield 1.
- Sambucus neo-mexicana*. K. Aldenham.
- Santolina Chamaecyparissus*. B. and U. Aldenham, Enfield.
- Sapindus Drummondii*. U. Aldenham.
- Sarcococca Hookeri*. B. and S. Aldenham; U. Enfield 5, Westonbirt.
- S. ruscifolia*. G. Stevenage 4; B. Wisley 2-4; U. Aldenham, Enfield 6.
- **Sargentodoxa cuneata*. U. Kew †, Leonardslee.
- Sarracenia purpurea*. U. Rostrevor.
- Saxegothea conspicua*. U. Aldenham.
- Schinus dependens*. K. Aldenham.
- Schizandra chinensis*. U. Wakehurst † N. 6.
- S. grandiflora*. K. Aldenham.
- S. Henryi*. U. Westonbirt.
- S. rubrifolia*. U. Aldenham.
- Securinea ramiflora*. U. Aldenham.
- Sedum confertum*. U. Wisley.
- S. dendroideum*. B. Grinstead.
- S. Palmeri*. U. Wisley, Enfield.
- S. prealtum*. G. Glasnevin; S. Rostrevor.
- **S. primuloides*. U. Enfield, Wisley.
- **S. pruinaum*. U. Enfield, Wisley.
- Semele androgyna*. G. Fota † S. 6; B. Rostrevor †.
- Senecio compactus*. K. Fota; U. Enfield 1, Wakehurst 7.
- S. elaeagnifolius*. K. Headfort, Stevenage; G. Enfield 4; S. Wakehurst 7.
- S. Greyi*. B. Crowsley, Glasnevin, Lanarth; S. Enfield.
- S. Hectori*. G. Glasnevin; U. Ludgvan, Rostrevor.
- **S. incanus*. U. Wisley.
- S. Kirkii*. U. Ludgvan.
- S. laxifolius*. K. Aldenham (also S.); B. Glasnevin; U. Enfield, Wakehurst 7, Wisley.
- S. Monroi*. G. Glasnevin; B. and U. Wakehurst 5.
- S. perdicoides*. K. Glasnevin, Rostrevor.
- S. rotundifolius*. S. Lanarth, Rostrevor (also U.).
- Shepherdia argentea*. } U. Aldenham.
- S. canadensis*. }
- Sinomenium acutum*. U. Aldenham.
- **Sinowilsonia Henryi*. U. Colesborne.
- **Smilax discotis*. S. Wisley.
- S. laxifolia*. B. Aldenham.
- S. scobinicaulis*. U. Aldenham.

- Smilax Sieboldiana*. B. Aldenham.
S. Veitchii. U. Aldenham.
Smolinium argutum. B. Rostrevor.
Solanum Capsicastrum. S. Isleworth.
S. crispum. K. Crawley 9, South Molton 6; G. Burnham 4; B. Lanarth; S. Carnarvon 5, Enfield† 3, Stow; U. Mangotsfield 4, Wakehurst 7.
S. jasminoides. K. Chipping Norton 5, Enfield† 7, Epping 3, Llandaff, Mangotsfield, Monreith† S. (also G.) 7, Tal-y-Cafn† S.W. 2-5, Slough 1, South Molton (also B.) 3, Stow 3; G. Colesborne†, Fota, Lanarth; U. Wakehurst†.
Sollya heterophylla. K. Exeter† 5, Fota†, Rostrevor†; G. Wakehurst† 3.
Sophora grandiflora. S. Monreith† 15.
S. japonica. U. Aldenham.
S. japonica pendula. B. Slough 3.
S. tetraptera. K. Sherborne 15; B. Wakehurst†; S. Nymans† 6.
S. tetraptera var. *microphylla*. S. Enfield, Mangotsfield.
S. viciifolia. B. Aldenham, Wisley; U. Enfield 7.
Sorbus Harroviana. U. Lanarth.
Spartium junceum. K. Aldersey (also B.) 3-10, Enfield, Gatton 12, Llandaff 2, Monreith (also B. and S.) 3, Oxon (also G.), Stow, Grinstead; G. Wakehurst (also B.); B. Wisley 10.
Sphaelea campanulata. K. Rostrevor.
Sphaeralcea Munroana. K. Rostrevor; U. Enfield 3.
S. pedata. B. Enfield 3.
Spiraea. All U. at Aldenham except *S. bullata*.
S. bullata. S. Aldenham, Enfield.
S. Millefolium. U. Aldenham.
S. Veitchii. U. Burnham.
**S. Wilsonii*. U. Burnham, Westonbirt.
Sprekelia formosissima. K. Isleworth.
Staphylea colchica. } U. Aldenham, Enfield.
**S. holocarpa*. }
S. pinnata. U. Aldenham.
Statice auriculaefolia. K. Harrow 3.
Staurtonia hexaphylla. G. Stevenage 20; S. Wakehurst† S. 6.
Stenocarpus salignus. S. Rostrevor.
Stizplanandra flexuosa. } U. Aldenham.
S. Tanakae. }
S. 54 Farrer. U. Enfield, Wisley.
Sterculia platanifolia. U. Fota.
Strawæsia Davidiana. U. Aldenham, Wakehurst† 4.
S. glaucescens. K. Aldenham, Headfort; B. Wakehurst 5.
S. undulata. S. Glasnevin; U. Aldenham, Burnham, Wakehurst 5, Westonbirt.
 Strawberries. Givon's Prolific. Laxton's Latest. Laxton's Latest of all. B. Guildford 2.

- Stuartia pentagyna.* } U. Aldenham.
S. Pseudo-camellia. }
S. serrata. U. Leonardslee 6.
Styphelia fasciculiflora. S. Rostrevor.
Styrax japonica. U. Aldenham, Wakehurst 8.
S. Obassia. K. Dorking; U. Wakehurst 8.
**S. Veitchiorum.* U. Kew 9, Leonardslee.
**S. Wilsonii.* K. Colesboine, Stevenage (also G. and B.); G.
 Stow, Wisley 2; U. Tortworth 3, Wakehurst 3.
Sutherlandia frutescens. K. Llandaff 2; Rostrevor (also S.).
Swainsonia coronillaefolia var. *alba.* S. Rostrevor.
**Sycopsis sinensis.* S. Aldenham (also U.), Enfield 3; U. Wakehurst.
Symplocos crataegoides. U. Aldenham.
Syringa japonica }
S. Juliana. }
S. Komarowi. }
S. × Lulece. }
S. persica. }
**S. pinnatifolia.* } U. Aldenham.
S. reflexa. }
**S. Sargentiana.* }
**S. Sweginzowii.* }
S. vulgaris. }
S. Wilsonii. }
S. yunnanensis. }
S. 786. Purdom. }

- Tacsonia mollissima.* K. Lanarth.
T. quitensis. G. Trebah† 7.
Tamarix gallica. S. Aldenham.
T. Pallasii rosea. B. and S. Aldenham.
T. tetrandra. S. Aldenham; U. Enfield.
Tapiscia sinensis. K. Aldenham; U. Kew 9 (injured in 1908-9).
 Rostrevor.
Taxodium mexicanum. K. Fota 5.
T. mucronatum. S. Rostrevor.
Taxus adpressa. U. Aldenham.
T. baccata. B. Northwich, Exeter (side facing E., also S.); S. Aldenham, Chatsworth, Enfield.
T. canadensis. }
T. cuspidata. } U. Aldenham.
T. repanda. }
T. 4053 Wilson. }
Tecoma radicans. K. Byfleet†; S. Aldenham, Enfield† S.
Telopea oreades. U. Ludgvan.
T. speciosissima. U. Ludgvan.
Templetonia retusa. K. Abbotsbury 4.
Tetracentron sinense. U. Wakehurst 2.

- Tetraclinis articulata*. S. Rostrevor.
Teucrium brevifolium. U. Rostrevor (one K.).
Teucrium Chamaedrys. U. Aldenham, Enfield.
T. fruticans. K. Nymans 4, Slough 3, Wakehurst 7 (also G.);
 G. Lanarth 20, Tal-y-Cafn† S.W. 2-10; B. Mangotsfield† 3;
 U. Rostrevor (some B.).
T. latifolium. K. Chipping Norton 4.
**Thalictrum dipterocarpum*. U. Wisley 4.
Thuya dolabrata. } U. Aldenham.
T. occidentalis. }
T. occidentalis Spaethii. K. Wisley.
 Thymes. K. nearly all species Harrow; B. Enfield.
Thymus corsicus. K. Harrow 4.
T. ericaefolius. K. Harrow 5.
T. micans. K. Gatton.
T. strictus. K. Harrow 2.
T. Serpyllum albus. B. Gatton.
T. Serpyllum lanuginosus. K. Gatton.
Tilia cordata. }
T. mandschurica. } U. Aldenham.
T. Miqueliana. }
T. Oliveri. U. Aldenham, Tortworth.
T. petiolaris. U. Aldenham.
Torreya californica. U. Aldenham.
Trachelospermum crocostomum. S. Lanarth 20; U. Wakehurst† 2.
T. Forrestii. S. Aldenham.
T. jasminoides. K. Nymans† 6; B. Lanarth 12; S. Wakehurst† 4.
Tricuspidaria dependens. K. Dawyck, Grinstead, Monreith (also B.)
 4; G. Uckfield 5; B. Carnarvon 4, Crowsley, Enfield 5, Nymans
 4, Wakehurst† 10; S. Crawley 9, Headfort; U. Rostrevor (one S.).
T. lanceolata. K. Aldenham (most plants, also B.), Dawyck,
 Epping 6, Llandaff (also G.); G. Uckfield (also B.) 7; B. Abbots-
 bury (one K.), Carnarvon 4, Crowsley, Exeter 14, Glas-
 nevin, Lyndhurst 6, Monreith† 15, Tal-y-Cafn (2 years' growth
 killed), Wakehurst 9, Woodbridge; S. Crawley 9, Headfort.,
 Nymans† N. 8; U. Westonbirt.
Triosteum perfoliatum. U. Aldenham.
Trilonia bracteata. U. Isleworth.
Tsuga Brunoniana. B. Glasnevin; U. Rostrevor, Wakehurst 8.
T. chinensis. U. Wakehurst 3.
Ulex europaeus. B. Aldenham, Cobham, Bergholt, Nymans (in
 open).
U. europaeus fl. pl. K. Aldenham, Leonardslee, Oxon (nearly all),
 Grinstead; G. Kew (also B. and S.) 25, Monmouth 30, Stow,
 Wakehurst (also B.); B. Burnham 20, Nymans, South Molton 4,
 Uckfield, Wisley, 4; S. Enfield, Farnborough.
U. Gallii. B. Aldenham.

Ulex nanus. B. Aldenham, Farnborough, Slough, Wisley 4; U. Enfield 15.

Ulmus parviflora. } U. Aldenham.
U. racemosa. }

Umbellularia californica. U. Rostrevor.

Vaccinium arboreum. B. Kew 10.

V. erythrocarpum. } U. Aldenham.
V. hirsutum. }

V. Mortinia. K. Kew 6.

Vegetables :

Broccoli, Kales, Brussels Sprouts. K. Chatsworth, Downham, Farnborough, Monmouth, Wye.

Globe Artichokes. K. Aylesbury, Beaconsfield, Dorking (also G.), Newbury; G. Slough.

Verbena chamaedryfolia. K. Grinstead, Harrow 1, Monreith 2, Stow.

V. venosa. K. Monreith 20, Slough 4, Stow; G. Enfield.

Veronica angustifolia. K. Kew, Wisley.

V. anomala. U. Woodbridge 1.

V. Armstrongii. K. Wisley 4.

V. azurea. K. Aldenham.

V. Balfouriana. K. Gatton 7, Hever 4; G. Glasnevin; S. Aldenham.

V. Bidwillii. K. Harrow 5, Slough 3; B. Aldenham.

V. buxifolia. U. Aldenham.

V. canterburyensis. B. Glasnevin; U. Aldenham.

V. chatamica. K. Aldenham.

V. cupressoides. K. Harrow 6; B. Wisley 6; U. Aldenham.

V. decumbens. U. Aldenham.

V. Dieffenbachii. G. Glasnevin.

V. diosmifolia. K. Kew, Wisley 3; U. Rostrevor.

V. edinensis. K. Aldenham; B. Enfield.

V. elliptica. K. Kew.

V. epacridia. B. Glasnevin.

V. Gaumlettii. }

V. Godefroyae. } K. Aldenham.

V. Guhricana. }

V. Hectori. K. Wisley 3; S. Enfield 10.

**V. Hermione*. K. Aldenham.

V. Hulkeana. K. Aldenham, Aldersey† (also B.) 7-10, Guildford; Mangotsfield 2, Wisley 3; B. Glasnevin, Headfort.

V. Kirkiana. U. Aldenham.

V. × La Seduisante. K. Aldenham, Enfield; S. Hayling Island.

V. ligustrifolia. } U. Aldenham.
V. Lindsayi. }

V. lobelioides. K. Aldenham (also S.), Tortworth 2; B. Enfield.

V. macrocarpa. K. Mangotsfield 2.

V. × newryensis. K. Kew.

- Veronica parviflora*. K. Kew, Enfield (old plants, seedlings S.), Wisley 5-10 (seedlings S.); B. Glasnevin.
- V. pinguifolia*. U. Woodbridge 1.
- V. salicifolia*. K. Harrow (also B., seedlings U.), Stow, Wisley 5-10; G. Hargham 6; S. Enfield; U. Carnarvon, Woodbridge 1.
- V. speciosa*. K. Kew.
- V.* var. 'Autumn Glory.' K. Hever 4; G. Woodbridge; B. Enfield, Glasnevin, Wisley.
- V. Traversii*. K. Aylesbury (also G. and B.) 15, Northwich 10 Wisley (also G.) 10-20; B. South Molton; S. Kew, Wisley 5; U. Aldenham (K. in 1895), Carnarvon, Enfield, Headfort, Wye.
- V. Veitchii*. K. Dorking 10, Enfield, Glasnevin.
- Veronicas* in general. K. Abbotsbury (many K. and others B.), Colesborne (most shrubby kinds; some B.), Crawley (all except *salicifolia*), Gatton, Harrow, Lanarth (some G. or B.), Nymans, all *Andersonii* vars.; Slough, N. Zealand vars.; G. Exeter; B. Crowsley (nearly all), Downham, Headfort, Newbury, Trebah (all except 'Royal Blue'), Wakehurst (especially *speciosa* vars.), Whitby; S. Hayling Island, Wakehurst (Whipcord vars.).
- Viburnum affine*. U. Westonbirt.
- V. betulifolium*. U. Aldenham.
- **V. buileifolium*. U. Burnham, Enfield 2.
- V. bullatum*. U. Aldenham, Enfield 6.
- V. burejaticum*. U. Aldenham.
- V. Carlesii*. U. Aldenham, Enfield, Mangotsfield 3, Stow, Wakehurst 7, Westonbirt, Wisley.
- V. cassinioides*. U. Aldenham, Westonbirt.
- **V. ceanothoides*. G. Wisley 2.
- V. cylindricum*. S. Crowsley, Wakehurst 7, Grinstead; U. Aldenham.
- V. dasyanthum*. S. Aldenham.
- V. Davidi*. S. Dorking 8; U. Aldenham, Burnham, Enfield 2, Wakehurst 5, Westonbirt.
- V. dilatatum*. U. Aldenham.
- V. foetidum*. K. Aldenham, Dawyck.
- V. foetidum* var. *rectangulum*. B. Aldenham; U. Westonbirt.
- V. Harryanum*. K. Kew (also B.) 8; S. Aldenham.
- V. Henryi*. K. Stevenage; U. Aldenham (also S.), Stow, Westonbirt.
- V. hupehense*. U. Aldenham.
- V. ichangense*. S. Aldenham.
- V. japonicum*. U. Aldenham, Wakehurst †.
- V. Lentago*.
- V. lobophyllum*.
- V. Mariesii*.
- V. molle*.
- V. olivatifolium*. K. Aldenham; B. Headfort, Lanarth, Wakehurst (also S.); S. Rostrevor.

- Viburnum orientale*. } U. Aldenham.
V. ovalifolium. }
V. propinquum. K. Dawyck ; U. Aldenham.
V. prunifolium. } U. Aldenham.
V. pyrifolium. }
V. rhytidophyllum. U. Aldenham, Burnham, and most places.
V. rufidulum. U. Aldenham.
V. rugosum. K. Aldenham, Crawley 5.
V. Sargentii. U. Aldenham, Westonbirt.
V. Sieboldii. U. Aldenham.
V. theiferum. U. Aldenham, Westonbirt.
V. Tinus. K. Aylesbury (also G. and B.) 40, Hitchin (also B.) ; G. Byfleet, Wisley ; B. Burnham, Oxon, Tortworth 15 ; S. Aldenham, Aldersey.
V. tomentosum. U. and S. Aldenham.
V. tomentosum var. *plicatum*. S. Aldenham.
V. utile. U. Aldenham, Burnham.
V. venosum. U. Aldenham, Westonbirt.
V. venosum Canbyi. U. Aldenham.
V. Wrightii. U. Aldenham.
Vinca major variegata. G. Slough 3.
Visnea Mocanera. S. Rostrevor†.
Vitex Agnus-castus. S. Aldenham.
V. littoralis. K. Abbotsbury.
Vitis Coignetiae. B. Edenhall 9.
V. flexuosa and vars. *major* and *Wilsonii*. U. Aldenham.
V. Henryi. K. Kew ; U. Colesborne, Enfield.
V. Piasezkii.
V. purpurea. } U. Aldenham, on walls.
V. rivularis. }
V. sinensis. }
V. solanis. }
V. striata. K. Headfort ; G. Carnarvon 8, Lyndhurst 4 ; B. Rostrevor†.
V. vulpina. } U. Aldenham.
V. 508 Purdom. }
Weinmannia racemosa. U. Rostrevor.
W. sylvicola. G. Glasnevin.
Westringia rosmariniformis. B. Rostrevor†.
Whipplea modesta. U. Rostrevor.
Widdringtonia Whytei. K. Abbotsbury ; B. Leonardslee† 4.
Wistaria multijuga. U. Aldenham, Enfield.
W. polystachya. S. Aldenham.
W. sinensis. U. Aldenham.
Xanthoceras sorbifolia. U. Aldenham.
Xanthorrhiza apiifolia. U. Aldenham, Enfield.
Xylosma racemosum var. *pubescens*. G. Glasnevin ; U. Rostrevor.

- Yucca angustifolia*. B. Aldersey 14; S. Enfield.
Y. baccata. U. Rostrevor.
Y. filamentosa. K. Harrow 7; G. and S. Aldersey; B. Wisley 8;
 U. Enfield 5.
Y. flaccida. B. Wisley 7; U. Enfield 20.
Y. gloriosa. B. Aldersey 14, Enfield 15, Wisley 12; U. Monmouth.
Y. recurvifolia. G. Enfield 15 (some B.; others, younger plants, S.);
 B. Stow, Wisley 5.
Y. rupicola. G. Colesborne.
Y. Sprenger's hybrids. B. Lanarth; U. Colesborne.
- Zanthoxylum acanthopodium*. K. Leonardslee, Rostrevor.
Z. alatum. B. Wakehurst 7.
Z. americanum. U. Aldenham.
**Z. Bungei*. U. Aldenham, Leonardslee.
Z. piperitum. S. Aldenham.
Z. planispinum. K. Aldenham; U. Wakehurst 2.
Z. schiniifolium. S. Aldenham.
Zenobia speciosa (Andromeda pulverulenta). U. Aldenham.
Zephyranthes candida major. B. Isleworth.
Z. candida × *citrina*. K. Isleworth.
Zizyphus Giraldui. S. Rostrevor.

DELPHINIUMS AT WISLEY, 1917.

THREE plants of each of two hundred and twenty-nine stocks of perennial Delphiniums were received for trial at Wisley in the autumn of 1915. They were planted on a well-dug, well-manured border and grown on for judging in 1915. The Floral Committee examined them on July 5 and again on July 20, 1917, and recommended the following awards:

Award of Merit. (A.M.)

SINGLE.

White.

227, 228, 229. Moerheimi (Barr, Ruys, Forbes) (A.M. 1909, Cumbush).

Light blue—eye light.

188, 189. Capri (Barr, Ruys).

192. Belladonna grandiflorum (Ruys).

Dark blue—eye light.

88. Professor Coleman (Baker).

Light blue bicolor—eye light.

90. Col. Sir Wyndham Murray (Blackmore & Langdon).

89. Lady Hammick (Blackmore & Langdon).

Dark blue bicolor—eye light.

12, 13. Lamartine (Barr, Ruys) (A.M. 1910, Perry).

SEMI-DOUBLE.

Light blue—eye light.

190. Lady Georgina Legge (Kelway).

127. Mrs. Shirley (Blackmore & Langdon).

103. Rozenlust (Ruys).

Light blue—eye dark.

186. Kingston Queen (Smith).

120. Mrs. A. J. Watson (Blackmore & Langdon).

Dark blue—eye dark.

183, 184. Harry Smetham (Ruys, Blackmore & Langdon) (A.M. 1912, Blackmore & Langdon).

Highly Commended (XXX).

SINGLE.

Light blue—eye light.

- 29. Hamlet (Bunyard).
- 77. Lord Lansdowne (Blackmore & Langdon).

Dark blue—eye light.

- 68, 70. Conspicua (Blackmore & Langdon, Barr).
- 62. Florence (Forbes).
- 75. His Excellency (Barr).

Dark blue—eye dark.

- 145. Lady Ravensworth (Ruys).

Light blue bicolor—eye dark.

- 92. Dawn (Kelway).

Dark blue bicolor—eye light.

- 60. Mrs. T. G. Baker (Baker).

Dark blue bicolor—eye dark.

- 19, 50. Macbeth (Hill, Bunyard).

SEMI-DOUBLE.

Light blue—eye light.

- 166. Dr. Lodwidge (Kelway) (A.M. 1912, Kelway).
- 4. Edwin Beckett (Baker).
- 67. Galicia (Baker).
- 195. Lovely (Kelway) (A.M. 1912, Kelway).
- 181. Mrs. James Kelway (Wisley) (A.M. 1912, Kelway).
- 185. Perfection (Blackmore & Langdon).
- 115. Star of Devon (Godfrey).
- 135. Statuaire Rude (Blackmore & Langdon) (A.M. 1908, Blackmore & Langdon).

Light blue—eye dark.

- 125. Amos Perry (Ruys).
- 131. Sergeant Beranger (Blackmore & Langdon).

Dark blue—eye light.

- 100, 101. Aeroplane (Barr, Ruys).
- 35. Attraction (Forbes).
- 98. Lord Curzon (Blackmore & Langdon).
- 52. Nobilis (Baker).

Dark blue—eye dark.

106. Corry (Ruys).
74, 75. Novelty (Blackmore & Langdon, Ruys).
41, 42. Robert Cox (Barr, Blackmore & Langdon).

DOUBLE.

Pale Lemon.

222. Luna (Baker).
223. Progression (Ruys) (A.M. 1908, Wallace).

Light blue—eye light.

80. Ma Mie (Barr).
32. Rev. E. Lascelles (Baker) (A.M. 1907, Walters).

Commended (XX).

Single light blue—eye light.

- 215, 216. Lize (Ruys, Barr).
207. Queen Mary (Bunyard).

Single dark blue bicolor—eye light.

47. Rt. Hon. A. E. Fellowes (Kelway).

Semi-double dark blue—eye light.

81. Miss Britton (Barr).

In addition the following, which appeared in the trial, had previously received an Award of Merit, but, as seen at the present trial, were not adjudged equal to those mentioned above :

221, Beauty of Langport (1895, Kelway) ; 194, Belladonna semi-plenum (1910, Perry) ; 102, Colonel Crabbe (1912, Forbes) ; 112, Cymbeline (1912, Bunyard) ; 202, Darius (1912, Bunyard) ; 103, Dr. Bergman (1912, Forbes) ; 117, Dusky Monarch (1912, Kelway) ; 2, Henry Moissan (1914, Blackmore & Langdon) ; 132, Lavanda (Ferguson) ; 71, Jessica (1912, Bunyard) ; 78, J. S. Sargent (1912, Forbes) ; 147, Lizzie Van Veen (1912, Box) ; 178, Monarch (1912, Notcutt) ; 134, Mrs. Colin McIver (1916, Blackmore & Langdon) ; 191, Mr. J. S. Brunton (1912, Ruys) ; 25, 26, The Alake (1907, Clark) ; 1, Smoke of War (1912, Kelway).

VARIETIES.

- | | |
|-----------------------------|-----------------------------------|
| 1. Smoke of War, B II. 2. † | 7. Daniel Osiris, B I. 1. |
| 3. Henri Moissan, B II. 2. | 8. Monarch of All, B I. 2. |
| 4. Garth, A b II. 2. | 9. Edwin Beckett, B I. 1. |
| 5. Daniel Osiris, B I. 1. | 10. Chamud, B II. 1. |
| 6. Mme. E. Geny, B II. 1. | 11. Mrs. Violet Hulston, B II. 1. |

* See footnote, p. 107.

† Where a number is omitted it indicates either that the plants represented by it failed, or that they were wrongly named. The letters and numerals following the names indicate the position of the variety in the descriptive list.

12. Lamartine, A b II. 1.
13. T. Thomas, B II. 1.
15. De Ruyter, B II. 1.
16. Zuster Lugten, B II. 2.
18. Gentian Blue, A b II. 2.
19. Francis F. Fox, B II. 1.
20. Kingston King, A b II. 1.
21. Salland, A a III. 2.
22. Pius Hendrik, B II. 1.
23. Hon. R. Lubbock, A a III. 1.
24. The Alake, B II. 1.
25. King of "Delphiniums, B II. 1.
27. Hamlet, A a II. 1.
28. Shylock, B II. 1.
30. Ariel, B I. 2.
31. Rev. E. Lascelles, C II. 1.
32. Steeple, A b II. 1.
34. Attraction, B II. 1.
35. Magnificent, A a III. 1.
37. Mrs. Trumperant Potts, A b II. 1.
38. Remarkable, B II. 1.
39. Lord Rosebery, B II. 1.
40. James William Kelway, B II. 1.
41. Robert Cox, B II. 2.
42. Walter T. Ware, B II. 1.
43. Sir Wroth Lethbridge, B II. 1.
44. Rosahe Ingram, B II. 2.
46. Miranda, B I. 1.
47. Rt Hon. A. E. Fellowes, A b II. 1.
48. Purple Rod, B II. 1.
50. Macbeth, A b II. 2.
51. Blue Rocket, B I. 2.
52. Nobilis, B II. 1.
53. Apemantes, A b II. 2.
54. Telegram, C II. 2.
55. His Excellency, A a III. 1.
59. Statehness, B II. 1.
60. Candidat, A b II. 1.
61. F. Carr, B II. 1.
62. Thomas Tilbrook, A a III. 1.
63. Mrs. T. G. Baker, A b II. 1.
64. K. Th. Caron, A b II. 1.
65. Florence, A a III. 1.
66. Lady Violet Brassey, A a III. 1.
67. T. Lindsay Watson, A a III. 1.
68. Masterpiece, A b II. 1.
69. Oxonian, A b II. 1.
70. Galicia, B I. 1.
71. Conspicua, A a III. 1.
72. Jessica, B II. 2.
73. Princess Juliana, B II. 2.
74. King Bladud, C II. 2.
75. Novelty, B II. 2.
76. Lady Granard, A a III. 2.
77. Lord Lansdowne, A a II. 1.
78. J. S. Sargent, B II. 2.
79. Mrs. O'Connor, B II. 1.
80. MaMie (syn. Princess Royal), C II. 1.
81. Miss Britton, B II. 1.
82. Ida R. Elliot, B I. 1.
83. Porthos, B I. 1.
84. Diamant, C III. 1.
85. Royal Standard, A a III. 1.
87. Blue Gem, B II. 1.
88. Professor Coleman, A a III. 1.
89. Lady Hammick, A b I. 1.
90. Col. Sir Wyndham Murray, A b I. 1.
92. Dawn, A b I. 2.
93. The MacLain of Lockbuie, A b I. 2.
94. Bayardo, B II. 1.
95. Splendour, A b II. 1.
96. Miss Nelly Weyman, B I. 2.
97. Antigone, B II. 1.
98. Lord Curzon, B II. 1.
100. Aeroplane, B II. 1.
101. Colonel Crabbe, B II. 1.
102. Rozenlust, B I. 1.
103. Capt. Smith Neil, B I. 1.
104. Corry, B II. 2.
105. Duke of Connaught, A b II. 1.
106. Dr. Bergman, B II. 1.
107. Lady Nina Balfour, B II. 2.
108. Willy Obreen, B I. 1.
109. Cymbeline, B II. 1.
110. Marion Riddle, B II. 1.
111. Lieutenant Delacommune, B I. 2.
112. Star of Devon, B I. 1.
113. In Remembrance, B II. 2.
114. Dusky Monarch, B II. 2.
115. Bassanio, B I. 1.
116. Mrs. A. J. Watson, B I. 2.
117. Andrew Carnegie, B II. 1.
118. Amos Perry, B I. 2.
119. Mrs. Shirley, B I. 1.
120. Progenitor, B II. 2.
121. Glory, B I. 1.
122. Lieutenant Vasseur, C III. 1.
123. Sergeant Beranger, B I. 2.
124. Lavanda, B I. 1.
125. Chantry Queen, B I. 2.
126. Mrs. Colin McIver, B I. 1.
127. Statuaire Rude, B I. 1.
128. Ustane, B II. 2.
129. Nymphe, B I. 1.
130. Mrs. Brouwer, B I. 1.
131. Hypatia, B I. 1.
132. Lady Conway, A b I. 2.
133. Ditton Blue, A b II. 1.
134. Blue Prince, A b II. 1.
135. Lady Ravensworth, A a III. 2.
136. Lizzie van Veen, A a II. 1.
137. Queen of Bath, A a II. 1.
138. Spire, A b II. 2.
139. Countess of Leitrim, A b II. 2.
140. René Quinton, C II. 1.
141. Nansen, A b II. 1.
142. Lord Kitchener, B I. 1.
143. James P. Robertson, B I. 1.
144. Lady Maud Warrender, A b II. 1.
145. Turquoise, B II. 1.
146. Ampère, B II. 2.
147. Nerissa, B II. 1.
148. Clippel, A a II. 1.
149. Lorenzo de Medici, B I. 1.
150. Mrs. R. M. Donaldson, A a III. 2.
151. John Forbes, A b I. 1.
152. Lavender, A b I. 1.
153. Lovely, B I. 1.
154. Dr. Lodwidge, B I. 1.

(a) Self-coloured.

(1) White.

227, 228, 229. *Moerheimi* (Barr, Ruys, Forbes), A.M. July 5, 1917.—Height 3 feet 6 inches to 5 feet; spike loose, tapering, 18 to 24 inches, branch spines numerous; flowers fairly large, white, tipped green; eye white with yellow hairs; spur long, sometimes slightly hairy; June 11.* Nos. 227 and 228 each threw some of pale blue flowers (var. *Capri*, see Nos. 183, 189). Raised by Messrs. Ruys in 1904.

219. Lady Isobel (Gibson).—Height 4 feet 6 inches; spike loose, tapering 24 inches; flowers of medium size, cream; eye yellow-bronze; spur long. June 18. Raised by Miss Dent of Ribston Hall, 1910.

June 18. Raised by Miss Dent of Ribston Hall, 1910.
221. Beauty of Langport (Ruys).—Height 4 feet 3 inches; spike crowded,
tapering, 19 inches; flowers single and semi-double, small to medium, cream.
eye yellow; spur long; June 25. Raised by Messrs. Kelway.

225. Polar Star (Barr).—Height 3 feet 6 inches; spike loose, ^{terminal} 15 inches; flowers of medium size, pale lemon yellow; eye yellowish; ^{spikes} fairly long; June 25.

(1) Eye Light.

193. *Belladonna* (Ruys).—Height 5 feet 6 inches; spike rather lax, tapering; 30 inches, branch spikes numerous; flowers of medium size, indigo, marbled lighter, eye bluish white with yellow hairs; spur long, sparingly hairy; June 11 to 14. July 30, 1917.—Height 4 feet 6 inches.

192. *Belladonna grandiflorum* (Ruys), A.M. July 20, 1917.—Height 4
3 inches; spike rather loose, tapering, 18 inches; branch spikes numerous;
flowers rather small, indigo darker streak near apex, outside ultra-marine;
eye lilac and yellow; spur long; June 25. Raised by Max Leichtlin.

* The date given is that of first flowering.

174. Blenheim (Forbes).—Height 6 feet 6 inches; spike rather loose, tapering, 17 inches, branch spikes numerous; flowers small, light sky-blue, slightly streaked greenish-purple; eye white; spur short; June 27. Raised by sender.

203. Branching Persimmon (Kelway).—Height 5 feet 3 inches; spike rather loose, tapering, 24 inches, branch spikes numerous; flowers rather small, deep sky-blue, purple spot near apex; eye light purple and yellow; spur long; June 21. Raised by sender.

188, 189. Capri (Barr, Ruys), A.M. July 5, 1917.—Height 5 feet 6 inches; spike lax, tapering, 24 inches, branch spikes numerous; flowers of medium size, sky-blue, outside light purplish; eye yellow and purplish-white; spur long; June 18. Of same parentage as 'Moorheimi' (Nos. 227 to 229). Raised by Messrs. Ruys, 1904.

195. Fanny Stormonth (Ruys).—Height 5 feet 6 inches; spike loose, tapering, 24 inches, branch spikes fairly numerous; flowers of medium size, indigo with deeper streaks in centre; eye purplish-white and yellow; spur long, sparsely hairy; June 11. Introduced by Messrs. Stormonth.

29. Hamlet (Bunyard), XXX July 20, 1917.—Height 6 feet; spike loose, rather blunt, 12 inches; flowers small, sky-blue, some slightly flushed purple; eye white; spur long; July 7. Raised by sender.

215, 216. Lize (Ruys, Barr), XX July 5, 1917.—Height 5 feet 6 inches; spike loose, tapering, 12 to 15 inches; flowers fairly large, sky-blue, slightly suffused purple; eye yellowish; spur long, sparsely hairy; June 20. A few flowers inclined to become semi-double. Raised by Mr. W. van Veen.

147. Lizzie van Veen (Barr).—Height 5 feet 6 inches; spike loose, almost blunt, 18 inches, branch spikes numerous; flowers large, sky-blue, faintly streaked purplish; eye purplish white and yellow; spur long; June 20. Foliage narrower than in 215, 216. Raised by Mr. W. van Veen.

209. Lord Furness (Forbes).—Height 5 feet 6 inches, spike fairly loose, tapering, 14 inches, branch spikes rather numerous; flowers small, dark sky-blue lighter centre; eye greenish yellow; spur long; July 2. Raised by sender.

77. Lord Lansdowne (Blackmore & Langdon), XXX July 20, 1917.—Height 5 feet; spike fairly loose, tapering, 10 inches; flowers large, deep sky-blue, slightly suffused purplish; eye white and yellow; spur long, sparsely hairy; July 7. Raised by sender.

191. Mr. J. S. Brunton (Ruys).—Height 4 feet 3 inches; spike loose, tapering, 18 inches, branch spikes numerous; flowers rather small, indigo, darker streak near apex, outside ultramarine; eye lilac and yellow; spur long, ultramarine; June 20. Raised by sender.

201. Opal (Kelway).—Height 6 feet 6 inches; spike loose, tapering, 16 inches; flowers small, light sky-blue; eye greenish yellow; spur long, sparsely hairy; June 20. Raised by sender, 1912.

206. Persimmon (Kelway).—Height 5 feet 6 inches; spike loose, tapering, 15 inches, branch spikes numerous; flowers rather small, sky-blue and mauve-purple; eye greenish; spur long, sparsely hairy; June 28. One plant was 'Azure.' Raised by sender, 1899.

202. Queen Mary (Bunyard), XX July 5, 1917.—Height 6 feet 6 inches; spike rather crowded, tapering, 16 inches; flowers large, indigo with lighter streaks and suffused purple; eye cream and yellow; spur short; June 20. Some flowers without spurs. Raised by sender, 1910. 'King of Delphiniums' x 'Belladonna.'

175, 176. Queen Wilhelmine (Ruys, Barr).—Height 7 feet 6 inches; spike loose, tapering, 18 inches, branch spikes long, numerous; flowers large, sky-blue, side petals suffused mauve-purple; eye white and yellow; spur rather short; June 25.

(2) Eye Dark.

159. Clipper (Forbes).—Height 5 feet 9 inches; spike loose, tapering, 22 inches; flowers rather small, deep sky-blue, slightly suffused purple; eye sepia and gold; spur of medium length, sparsely hairy; June 27. Raised by sender.

148. Queen of Bath (Blackmore & Langdon).—Height 5 feet 6 inches; spike loose, blunt, 17 inches; flowers large, sky-blue, slightly suffused light purple; eye sepia and gold; spur long, sparsely hairy; June 20. Raised by senders.

200. Twertonian (Blackmore & Langdon).—Height 5 feet 8 inches; spike loose, tapering, 20 inches; flowers of medium size, sky-blue, some slightly tinged purple; eye greenish white; spur long; June 25. Raised by senders.

III. *Dark Blue.*(1) *Eye Light.*

68, 70. *Conspicua* (Blackmore & Langdon, Barr). No. 68, XXX July 20, 1917.—Height 6 feet; spike loose, tapering, 16 to 24 inches; flowers of medium size, indigo, purplish towards apex and centre; eye white and yellow; spur long, sparsely hairy; June 20. No. 70 had numerous branch spikes and foliage different from 68. Raised by Messrs. Blackmore & Langdon.

62. *Florence* (Forbes), XXX July 5, 1917.—Height 5 feet; spike loose, tapering, 18 inches; branch spikes medium; flowers small, indigo streaked lighter; eye white and yellow; spur long, sparsely hairy. June 25. Raised by sender.

55. *His Excellency* (Barr), XXX July 5, 1917.—Height 6 feet 6 inches; spike loose, tapering, 30 inches, branch spikes numerous; flowers small, indigo deeper at margins; eye purplish white and yellow; spur of medium length; June 21. Raised by sender.

24. *Hon. R. Lubbock* (Kelway).—Height 6 feet; spike loose, tapering, 42 inches; flowers of medium size, indigo suffused purple; eye cream and yellow; spur of medium length; June 20. Raised by sender.

63. *Lady Violet Brassey* (Forbes).—Height 5 feet; spike loose, tapering, 18 inches, branch spikes medium; flowers small, indigo, streaked lighter; eye white and yellow; June 25. Raised by sender.

36. *Magnificent* (Kelway).—Height 6 feet 6 inches; spike loose, tapering, 20 inches; flowers rather small, indigo deeper margins; eye sepia and yellow; spur short; June 20. Raised by sender.

88. *Professor Coleman* (Baker), A.M. July 5, 1917.—Height 6 feet; spike rather close, tapering, 24 inches, branch spikes numerous; flowers of medium size, indigo, some slightly flushed purple; eye green and white; spur of medium length; June 27.

86. *Royal Standard* (Wisley).—Height 2 feet 6 inches; spike, crowded, tapering, 20 inches, branch spikes numerous; flowers small, indigo, some suffused purple; eye yellowish white; spur long; June 21.

59. *Thomas Tilbrook* (Barr).—Height 5 feet 6 inches; spike rather crowded, slightly blunt, 18 inches, branch spikes numerous; flowers small, Antwerp blue; eye white and yellow; spur long; June 30.

64. *T. Lindsay Watson* (Forbes).—Height 5 feet; spike loose, tapering, 18 inches, branch spikes medium; flowers small, indigo streaked lighter; eye white and yellow; spur long, sparsely hairy; July 1. Raised by sender, 1913.

(2) *Eye Dark.*

76. *Lady Granard* (Forbes).—Height 4 feet 6 inches; spike fairly loose, tapering, 9 inches, branch spikes numerous; flowers small, indigo, slightly streaked purple; eye sepia and gold; spur long; July 1. Raised by sender.

145. *Lady Ravensworth* (Ruys), XXX July 5, 1917.—Height 4 feet 9 inches; spike fairly loose, tapering, 22 inches; flowers rather small, indigo, very slightly suffused darker; eye sepia and gold; spur long; June 22. Distinctly *Verbas-cum*-like. Raised by Messrs. Michie & Co.

162. *Mrs. R. M. Donaldson* (Forbes).—Height 7 feet; spike loose, tapering, 18 inches, flowers small, sky-blue; eye sepia and gold; spur fairly long, sparsely hairy; June 30. Mixed stock. Raised by sender.

22. *Salland* (Ruys).—Height 3 feet; spike loose, tapering, 14 inches; flowers of medium size, royal blue, outside ultramarine; eye yellowish; spur long, sparsely hairy; June 6. Raised by sender.

(b) *Bicolor.*I. *Light Blue.*(1) *Eye Light.*

211. *Azure* (Kelway).—Height 5 feet; spike loose, slightly tapering, 14 inches; flowers small, sky-blue and mauve-purple; eye greenish; spur long; June 28. Mixed stock. Raised by sender.

90. *Col. Sir Wyndham Murray* (Blackmore & Langdon), A.M. July 5, 1917.—Height 6 feet 6 inches; spike loose, tapering, 24 inches, branch spikes numerous; flowers semi-duplex, large, indigo, suffused dull purple, some tipped white; eye white and yellow; spur long; June 27. One plant with very hairy inflorescence when young, flowering earlier, with downy spur and outer petals. Raised by senders.

214. *Eoid* (Barr).—Height 5 feet; spike loose, tapering, 15 inches, branch spikes medium; flowers small, indigo, purplish margins; eye white and yellow; spur long; June 26.

163. *John Forbes* (Forbes).—Height 6 feet 6 inches; spike rather crowded, blunt, 9 inches; flowers small, sky-blue slightly suffused purplish centre; eye mauve-white; spur long, sparsely hairy; June 30. Raised by sender.

140. *Lady Conway* (Bunyard).—Height 7 feet; spike fairly loose, tapering, 24 inches; flowers of medium size, indigo, slightly suffused purple, outside lilac; eye white and green; spur fairly long; June 20. Some flowers with an extra purple petal. Raised by senders.

80. *Lady Hammick* (Blackmore & Langdon), A.M. July 5, 1917.—Height 6 feet; spike fairly loose, rather blunt, 18 inches; flowers semi-duplex, large, deep sky-blue, suffused purple at base; eye white and yellow; spur long, sparsely hairy; June 30. Very broad petals. Raised by the Rev. E. Lascelles.

180. *Lady Joan Verney* (Baker).—Height 5 feet 3 inches; spike fairly crowded, tapering, 18 inches; flowers large, sky-blue, flushed light purple towards apex; eye white and yellow; spur of medium length, sparsely hairy; July 3. Raised by sender.

164. *Lavender* (Barr).—Height 4 feet 6 inches; spike loose, tapering, 12 to 15 inches; flowers small, sky-blue, faintly streaked purple; eye white and yellow; spur long; June 12. Of Dutch origin; introduced by Messrs. Barr.

187. *Lorna Doone* (Barr).—Height 6 feet; spike fairly loose, tapering, 14 inches, branch spikes fairly numerous; flowers large, sky-blue, slightly suffused, light purple; eye purplish white and yellow, spur fairly long, June 25. Some flowers with extra light purple petal. Raised by Messrs. Barr.

178. *Monarch* (Forbes).—Height 6 feet 6 inches; spike crowded, tapering, 10 inches, branch spikes fairly numerous; flowers small, sky-blue, some petals suffused purple; eye white and yellow; spur long, sparsely hairy; July 2. Spikes crooked. Raised by sender.

210. *Star of Langport* (Kelway).—Height 5 feet 6 inches; spike loose, tapering, 18 inches; flowers of medium size, sky-blue, purplish streak in centre; eye greenish yellow; spur long; June 28. Some semi-double. Raised by sender.

173. *Sordello* (Barr).—Height 4 feet 3 inches; spike loose, tapering, 14 inches; flowers rather small, sky-blue, some petals suffused light purple; eye greenish yellow, spur rather short; June 27.

208. *Yvette Guilbert* (Blackmore & Langdon).—Height 6 feet 6 inches; spike loose, tapering, 24 inches, branch spikes numerous; flowers large, sky-blue and light purple; eye white and yellow; spur long, sparsely hairy; June 28.

(2) Eye Dark.

92. *Dawn* (Kelway), XXX July 5, 1917.—Height 5 feet; spike fairly loose, tapering, 18 inches; branch spikes fairly numerous; flowers of medium size, light sky-blue, slightly suffused mauve-purple; eye purplish sepia and gold; spur long, sparsely hairy; June 25. Distinct, one taller, dark indigo. Raised by senders, 1915.

93. *The MacLain* of Lockbuie (Kelway).—Height 5 feet 6 inches; spike crowded, tapering, 12 inches; flowers of medium size, sky-blue tinged purple; eye sepia and gold; spur short, sparsely hairy; July 2. Raised by sender, 1915.

II. Dark Blue.

(1) Eye Light.

144. *Blue Prince* (Barr).—Height 6 feet 6 inches; spike loose, tapering, 27 inches; flowers of medium size, indigo suffused purple; eye white and yellowish; spur long, sparsely hairy; June 18. Some flowers more purple and crowded. Raised by sender.

57. *Candidat* (Baker).—Height 6 feet; spike loose, tapering, 20 inches, branch spikes numerous; flowers small to medium, indigo, purple margins, lighter in centre; eye white and yellow; spur long; June 20. Raised by Mr. van Veen.

212. *China Blue* (Kelway).—Height 4 feet 10 inches; spike rather close, blunt, 5 inches, interrupted below; flowers semi-duplex, fairly large, indigo, paler in centre; eye white and yellow; spur short, sparsely hairy; June 13. Raised by sender, 1910.

143. *Ditton Blue* (Barr).—Height 6 feet; spike loose, tapering, 20 inches; flowers of medium size, indigo suffused purple margins; eye white and yellowish; spur medium; June 18. Some plants dwarfier with blunt. Raised by sender.

107, 108. Duke of Connaught (Barr, Kelway).—Height 6 to 7 feet; spike fairly loose, tapering, 22 to 24 inches; flowers single and semi-double, of medium to large size, indigo suffused purple; eye whitish; spur of medium length; June 18. No. 108 had more numerous branch spikes and some dark-eyed flowers, and No. 107 some crooked spikes. Raised by Messrs. Kelway, 1905.

213. Geraldine Kelway (Kelway).—Height 5 feet 6 inches; spike loose, tapering, 20 inches; flowers of medium size, indigo suffused dull purple at margins; eye white and yellow; spur long; June 28. Raised by sender, 1912.

21. Kingston King (Smith).—Height 5 feet; spike loose, tapering, 24 inches, branch spikes fairly numerous; flowers of medium size, royal blue suffused purple; eye greenish yellow; spur long, sparsely hairy; June 13. Introduced by sender.

61. K. Th. Caron (Ruys).—Height 5 feet 3 inches; spike loose, tapering, 14 inches; flowers large, indigo, streaked lighter, suffused purple margins; eye white and yellow; spur long; June 25. One plant with blunt, crowded spikes and branch spikes, like 'Masterpiece,' which has broader foliage.

155. Lady Maud Warrender (Forbes).—Height 5 feet 6 inches; spike fairly loose, tapering, 16 inches; branch spikes numerous; flowers small, indigo, side petals suffused purple; eye cream and yellow; spur long, sparsely hairy; June 30. Raised by sender, 1906.

12, 13. Lamartine (Barr, Ruys), A.M. July 20, 1917.—Height 4 feet 3 inches; spike loose, tapering, 18 inches, branch spikes fairly numerous; flowers small, ultramarine, suffused purple, streaked indigo; eye whitish; spur long; June 20. Introduced by Messrs. Barr.

65. Masterpiece (Barr).—Height 5 feet 6 inches; spike crowded, blunt, 17 inches, branch spikes rather numerous; flowers large, indigo, suffused purple margins; eye white and yellow; spur long; June 25. Very like 'K. Th. Caron,' but blunt spikes, more numerous branch spikes and broader foliage. Raised by sender.

37. Mrs. Trumperant Potts (Baker).—Height 6 feet; spike crowded, tapering, 24 inches; flowers small, indigo, faintly purple at margins; eye cream and yellow; spur long; June 18. Raised by sender; a seedling of 'Mme. Wale Gueslin,' 1910.

60. Mrs. T. G. Baker (Baker), XXX July 5, 1917.—Height 5 feet 9 inches; spike crowded, tapering, 16 to 24 inches; flowers large, indigo, streaked dull red-purple; eye yellowish white; spur long; June 21. Raised by sender, 1912.

179. N. F. Barnes (Forbes).—Height 6 feet; spike crowded, tapering, 12 inches; flowers indigo, slightly streaked purple; eye white and yellow; spur rather short, sparsely hairy; July 3. Raised by sender, 1913.

152. Nansen (Forbes).—Height 6 feet; spike crowded, tapering, 18 inches, branch spikes long, numerous; flowers single and semi-double, large, sky-blue, slightly suffused purple; eye yellow and purplish white; spur long, sparsely hairy; June 26. Raised by sender, 1905.

66. Oxonian (Barr).—Height 4 feet; spike fairly loose, tapering, 12 inches; flowers rather small, indigo, with darker streaks; eye purplish white and yellow; spur long, June 18. Slightly lighter than Nos. 68 and 70, and dwarfier. Raised by sender.

47. Rt. Hon. A. E. Fellowes (Kelway), XX July 5, 1917.—Height 7 feet 6 inches to 8 feet; spike loose, tapering, 30 inches, branch spikes rather numerous; flowers large, indigo, suffused purple; spur long, sparsely hairy; June 25. Raised by sender, 1907.

95. Splendour (Kelway).—Height 6 feet; spike fairly loose, tapering, 20 inches; branch spikes long and numerous; flowers large, indigo, suffused purple margins; eye white and yellow; spur long, stout; June 25. Raised by sender, 1913.

34. Steeple (Forbes).—Height 2 feet 3 inches; spike loose, tapering, 16 inches, branch spikes numerous; flowers large, indigo, broad purple margins; eye cream and yellow; spur long, sparsely hairy; June 25. Raised by sender.

(2) Eye Dark.

53. Apemantes (Barr).—Height 6 feet; spike loose, tapering, 24 inches, branch spikes fairly numerous; flowers small to medium, indigo streaked purple, eye sepia and yellow; spur of medium length, sparsely hairy; June 18.

150. Countess of Leitrim (Kelway).—Height 5 feet; spike loose, tapering, 16 inches, branch spikes fairly numerous; flowers large, indigo, suffused purple margins; eye sepia and gold; spur fairly long, sparsely hairy; June 25. A few flowers with one extra petal. Raised by sender.

4. Garth (Forbes).—Height 6 feet; spike loose, tapering, 21 inches, branch spikes numerous; flowers of medium size, sky-blue, suffused light purple; eye sepia and gold; spur of medium length; July 1. A few semi-double flowers. Raised by sender.

19, 50. Macbeth (Hill, Bunyard), XXX July 5, 1917.—Height 4 feet 9 inches to 5 feet; spike crowded, tapering, 18 to 24 inches, branch spikes fairly numerous; flowers small to medium, indigo, purplish towards apex, outside ultramarine, nearly a self; eye purple and gold; spur long, June 13. No. 19 was sent in as 'Gentian Blue,' raised by Capt. V. Hill in 1913, but 'Macbeth,' raised by Messrs. Bunyard, 1910, is the older plant and name.

149. Spire (Forbes).—Height 5 feet; spike loose, tapering, 20 inches; flowers single and semi-double, small, indigo, slightly suffused purple (one purple petal); eye sepia and yellow; spur of medium length, sparsely hairy; June 25. Buds shining ultramarine. Raised by sender.

B. FLOWERS SEMI-DOUBLE (DUPLEX).

I. Light Blue.

(1) Eye Light.

115. Bassanio (Bunyard).—Height 6 feet 6 inches; spike crowded, tapering, 21 inches; flowers large, sky-blue, suffused mauve-purple towards apex; eye white and yellow; spur long, sparsely hairy; June 27. Raised by sender.

194. Belladonna semiplenum (Ruys).—Height 4 feet; spike loose, tapering, 48 inches, branch spikes numerous; flowers of medium size, light indigo, suffused purple at apex; eye yellow-green; spur long; June 18.

101. Capt. Smith Neil (Forbes).—Height 6 feet 6 inches; spike crowded, tapering, 24 inches; flowers large, light dull purple, sky-blue margins; eye greenish; spur fairly long, sparsely hairy; July 9. Flowers of striped appearance. Raised by sender.

5, 7. Daniel Osiris (Blackmore & Langdon, Ruys), XXX July 20, 1917.—Height 5 feet 6 inches; spike crowded, tapering, 24 inches, branch spikes strong, numerous; flowers large, indigo, suffused purple streak on each petal; eye greenish; spur long, sparsely hairy; July 7. Raised by M. Lemoine.

105. Dr. Lodwidge (Kelway), XXX July 5, 1917.—Height 6 feet 6 inches; spike loose, tapering, 24 inches; flowers small, indigo, purplish centre; eye green; spur rather short, sparsely hairy; June 25. Raised by sender.

9. Edwin Beckett (Baker), XXX July 5, 1917.—Height 6 feet to 6 feet 6 inches; spike loose, tapering, 24 inches; flowers large, indigo, suffused purple; eye sepia and greenish white; spur of medium length, sparsely hairy; June 20. One plant dwarfier with duller flowers and dense spikes.

168, 169. Elsie (Blackmore & Langdon, Barr).—Height 5 feet 9 inches; spike rather crowded, tapering, 18 inches, branch spikes fairly numerous; flowers large, sky-blue, suffused purple in centre; eye greenish white; spur of medium length; June 25.

67. Galicia (Baker), XXX July 5, 1917.—Height 6 feet 8 inches; spike rather crowded, 20 inches; flowers large, indigo, purple towards apex; eye white and purple; spur long, sparsely hairy; June 25. Raised by Mr. Smith; a seedling from 'Alake,' 1911.

129. Glory (Blackmore & Langdon).—Height 5 feet; spike rather crowded, tapering, 2 feet; flowers of medium size, light purplish mauve (lavender); spur long; June 18. Raised by Mr. van Veen.

217. Glory of Edentown (Fairbairn).—Height 2 feet 8 inches; spike loose, tapering, 8 inches, branch spikes fairly numerous; flowers large, sky-blue, suffused purple-mauve; eye white and green; spur rather short; June 18. Spike probably longer when well grown. Raised by sender, 1912.

197. Hugo Poortman (Ruys).—Height 6 feet; spike crowded, slightly tapering, 27 inches, branch spikes numerous; flowers large, sky-blue, much suffused light mauve-purple; eye greenish; spur fairly long; June 20. Fine spike. Raised by sender 1905, introduced 1911.

139. Hypatia (Bunyard).—Height 4 feet 9 inches; spike fairly loose, tapering, 16 to 18 inches; flowers large, deep sky-blue, slightly streaked purple, extra petals purple; eye yellowish; spur of medium length; June 22. Flowers irregular in colour. Raised by sender.

83. Ida R. Elliot (Blackmore & Langdon).—Height 5 feet 3 inches; spike loose, rather blunt, 12 inches; flowers large, sky-blue, suffused purple margins; eye greenish; spur long, sparsely hairy; July 9. Raised by Mr. van Veen.

154. James P. Robertson (Forbes).—Height 4 feet 9 inches; spike fairly loose, tapering, 12 inches; branch spikes fairly numerous; flowers of medium size, single and semi-double, indigo, some suffused purple; eye greenish white, spur fairly long; June 28. One plant dwarfer and more purple. Raised by sender.

190. Lady Georgina Legge (Kelway), A.M. July 5, 1917.—Height 6 feet 6 inches; spike loose, tapering, 27 inches; branch spikes numerous; flowers of medium size, royal blue, streaked light purple; eye yellow and green; spur short, sparsely hairy; June 27. Flower almost regular of two series of petals, fine blue. Raised by sender.

132. Lavanda (Blackmore & Langdon).—Height 5 feet; spike crowded, blunt, 18 inches; flowers large, dark sky-blue and light mauve-purple; eye white and green; spur long, sparsely hairy; June 30. Raised by Mr. Ferguson.

153. Lord Kitchener (Forbes).—Height 6 feet; spike rather crowded, tapering, 18 inches, branch spikes long, numerous; flowers large, sky-blue, slightly suffused purple; eye yellow and purplish white; spur long, sparsely hairy; June 20. Raised by sender, 1903.

161. Lorenzo de Medici (Blackmore & Langdon).—Height 5 feet 3 inches; spike fairly loose, in whorls, tapering, 18 inches; flowers large, sky-blue and mauve-purple; eye yellowish white; spur rather short, sparsely hairy; July 2. Petals pointed and incurved, distinct.

165. Lovely (Kelway), XXX July 5, 1917.—Height 7 feet; spike loose, tapering, 26 inches; flowers large, light mauve purple, streaked sky-blue, outer petals strongly suffused; eye white and green; spur rather short; June 22. Raised by sender.

46. Miranda (Bunyard).—Height 4 feet 6 inches; spike rather crowded, tapering, 14 inches; flowers large, indigo and light mauve-purple; eye greenish; spur short; June 20. Raised by sender.

138. Mrs. Brouwer (Blackmore & Langdon).—Height 5 feet 6 inches; spike fairly crowded, rather blunt, 16 inches; flowers large, sky-blue and mauve-purple; eye white and yellow; spur fairly long, sparsely hairy; June 30.

134. Mrs. Colin McIver (Blackmore & Langdon).—Height 6 feet; spike loose, tapering, 20 inches, branch spikes numerous; flowers large, light purple-mauve (lilac); eye white and yellow; spur short; June 18. One plant dwarfer with blunt spikes. Raised by sender.

172. Mrs. Fred Carr (Baker).—Height 4 feet 3 inches; spike fairly loose, slightly tapering, 13 inches; flowers large, sky-blue, suffused light purple; eye greenish yellow; spur rather short, sparsely hairy; June 26. Raised by Mr. Smith.

181. Mrs. James Kelway (Wisley), XXX July 5, 1917.—Height 5 feet 3 inches; spike rather crowded, tapering, 14 inches; flowers large, sky-blue flushed purple; eye yellowish white; spur fairly long; June 20. Raised by Messrs. Kelway, 1912.

127. Mrs. Shirley (Blackmore & Langdon), A.M. July 5, 1917.—Height 7 feet; spike somewhat crowded, tapering, 24 inches, branch spikes fairly numerous; flowers fairly large, sky-blue, suffused light mauve-purple; eye white and green; spur short; June 25. The purest mauve. Raised by sender.

137. Nymphé (Barr).—Height 3 feet 6 inches; spike crowded, blunt, 9 inches; flowers large, sky-blue, purple streak in centre; eye white; spur short, sparsely hairy; July 10. Raised by sender.

185. Perfection (Blackmore & Langdon), XXX July 20, 1917.—Height 6 feet 6 inches; spike crowded, tapering, 14 inches; flowers fairly large, sky-blue, suffused mauve-purple towards apex; eye white and greenish; spur long; July 3. Raised by senders.

84. Porthos (Barr).—Height 6 feet; spike fairly loose, tapering, 24 inches, branch spikes numerous; flowers large, indigo, with purple centre; eye yellowish white; spur rather short, sparsely hairy; June 20. Raised by sender.

171. Queen of Spain (Ruys).—Height 5 feet to 6 feet 6 inches; spike fairly crowded, tapering, 24 inches; flowers large, sky-blue and light mauve-purple; eye greenish yellow; spur of medium length, sparsely hairy; June 12.

103. Rozenlust (Ruys), A.M. July 5, 1917.—Height 7 feet; spike rather crowded, tapering, 18 inches, branch spikes fairly numerous; flowers large, sky-blue, suffused mauve-purple; eye greenish; spike fairly long, sparsely hairy; June 27. Raised by Mr. W. van Veen.

115. Star of Devon (Godfrey), XXX July 5, 1917.—Height 6 feet; spike loose, tapering, 23 inches, branch spikes long, numerous; flowers large, sky-blue, suffused light mauve-purple; eye cream with purple streak; spur of medium length, sparsely hairy; June 25. Raised by sender.

135. *Statuaire Rude* (Blackmore & Langdon), XXX July 20, 1917.—Height 5 feet 3 inches; spike fairly crowded, tapering, 15 inches; flowers large, sky-blue, suffused mauve-purple; eye white and yellow; spur short, sparsely hairy; July 14. Raised by M. Lemoine.
111. *Willy Obreen* (Ruys).—Height 6 feet 9 inches; spike rather crowded, tapering, 18 inches; flowers large, sky-blue, suffused purple towards apex; eye green; spur long; June 30.

(2) *Eye Dark.*

125. *Amos Perry* (Ruys), XXX July 5, 1917.—Height 6 feet 3 inches; spike loose, tapering, 24 inches; flowers of medium size, sky-blue, and light mauve-purple; eye yellowish green; spur long; June 18.
31. *Ariel* (Bunyard).—Height 6 to 7 feet; spike fairly crowded, tapering, 30 inches; flowers large, light sky-blue, suffused purplish mauve; eye sepia; spur long; June 15. Raised by sender.
167. *Baroness Henrietta van Thuyll* (Blackmore & Langdon).—Height 5 feet; spike loose, tapering, 24 inches; flowers large, sky-blue and light purple centre; eye sepia and yellow; spur short; June 20. Raised by Mr. van Veen.
51. *Blue Rocket* (Elliott).—Height 5 feet 6 inches; spike fairly crowded, tapering, 20 inches; flowers sky-blue, flushed purple; eye sepia and gold; spur short, sparsely hairy; July 9. Raised by Mr. C. Elliott.
133. *Chantry Queen* (Blackmore & Langdon).—Height 5 feet; spike crowded, rather blunt, 15 inches; branch spikes fairly numerous; flowers large, dark sky-blue, and light mauve-purple; eye sepia and gold; spur rather short; July 7; spike thickest towards apex. Introduced by senders.
182. *Explorateur Flamand* (Barr).—Height 5 feet 6 inches; spike crowded, tapering, 17 inches; flowers large, mauve-purple, indigo margins; eye purplish brown and gold; spur long, sparsely hairy; July 7.
186. *Kingston Queen* (Smith), A.M. July 5, 1917.—Height 7 feet 6 inches; spike loose, but inclined to be crowded in lower part, tapering, 32 inches, branch spikes numerous; flowers of medium size, sky-blue suffused from base with light purple; eye greenish, sometimes sepia; spur rather short; June 25. Raised by sender.
114. *Lieutenant Delacommune* (Blackmore & Langdon).—Height 5 feet, spike rather crowded, somewhat blunt, 13 inches; flowers large, sky-blue, suffused mauve-purple; eye sepia and gold; spur short, sparsely hairy; July 7. Raised by M. Lemoine.
96. *Miss Nellie Weyman* (Ruys).—Flowers sky-blue and mauve-purple; eye dark; June 25.
8. *Monarch of All* (Kelway).—Height 7 feet; spike loose, tapering, 30 to 36 inches; flowers large, indigo suffused dull purple; eye greenish sepia and yellow; spur of medium length, sparsely hairy; June 25. Raised by sender, 1912.
120. *Mrs. A. J. Watson* (Blackmore & Langdon), A.M. July 5, 1917.—Height 7 feet; spike somewhat crowded, tapering, 24 inches; flowers large, indigo and lightish purple; eye sepia and yellow; spur fairly long; June 25. Raised by sender.
131. *Sergeant Beranger* (Blackmore & Langdon), XXX July 20, 1917.—Height 6 feet, spike rather crowded, tapering, 12 inches; flowers large light purple, indigo margins; eye sepia and purple; spur long; July 7. Raised by M. Lemoine.

II. *Dark Blue.*(1) *Eye Light.*

- 100, 101. *Aeroplane* (Barr, Ruys), XXX July 5, 1917.—Height 6 feet; spike loose, tapering, 20 inches, branch spikes long, numerous; flowers large, indigo, suffused purple; eye white and yellow; spur short, sparsely hairy; June 25.
122. *Andrew Carnegie* (Ruys).—Height 7 feet; spike loose, tapering, 24 inches, branch spikes fairly numerous; flowers of medium size, indigo, margins suffused dull purple; eye white and yellow; spur fairly long; July 25.
97. *Antigone* (Ruys).—Height 6 feet; spike rather crowded, somewhat blunt, 18 inches; flowers large, indigo and purple; eye yellow-green; spur long; July 7.
35. *Attraction* (Forbes), XXX July 5, 1917.—Height 7 feet 3 inches; spike loose, tapering, 30 inches; flowers fairly large, indigo suffused purple; eye green and white; spur short, sparsely hairy; June 26. Raised by sender, 1908.

94. Bayardo (Kelway).—Height 7 feet; spike fairly crowded, tapering, 24 inches; flowers of medium size, dark purple with ultramarine margins; eye greenish yellow; spur long, sparsely hairy; July 2. One plant dwarf, hoary when young, with small flowers. Raised by sender.

87. Blue Gem (Barr).—Height 3 feet; spike lax, interrupted, tapering, 17 inches, branch spikes numerous; flowers large, irregular, indigo streaked and suffused purple; eye white; spur long; June 27. Raised by sender.

10. Chamud (Ruys).—Height 6 feet 6 inches; spike fairly crowded, slightly tapering, 24 inches, branch spikes slender, medium; flowers large, indigo and purple; eye greenish white and sepia; spur of medium length; June 14. One plant slender, much dwarfer and with less cut leaves. Raised by M. Lemoine.

102. Colonel Crabbe (Wisley).—Height 6 feet 6 inches; spike rather crowded, tapering, 24 inches; flowers large, indigo and purple with deeper margins; eye greenish white; spur rather short; June 15.

112. Cymbeline (Wisley).—Height 6 feet 6 inches; spike fairly crowded, tapering, 24 inches; branch spikes numerous; flowers of medium size, indigo and purple; eye greenish, some white; spur fairly long; June 18.

16. De Ruyter (Ruys).—Height 6 feet; spike rather crowded, tapering, 24 inches; branch spikes numerous; flowers of medium size, indigo and purple; eye yellowish and white; spur of medium length; sparsely hairy; June 20.

109. Dr. Bergman (Wisley).—Height 5 feet; spike loose, tapering, 18 inches; branch spikes long, fairly numerous; flowers large, indigo, heavily suffused purple apex and margins; eye cream and purple; spur fairly long, sparsely hairy; June 27.

58. E. Carr (Kelway).—Height 5 feet 6 inches; spike rather crowded, tapering, 20 inches; flowers large, indigo and dull red purple; eye cream and yellow; spur short; June 18. Raised by sender.

20. Francis F. Fox (Ruys).—Height 5 feet; spike loose, tapering, 24 inches; flower large, indigo suffused purple; eye white; spur fairly long; June 21.

40. James William Kelway (Kelway).—Height 6 feet to 6 feet 6 inches; spike loose, tapering, 24 inches; flowers large, purple, tipped indigo; eye yellowish white; spur of medium length; June 25. Raised by sender, 1912.

27, 28. King of Delphiniums (Barr, Ruys).—Height 4 feet 6 inches to 6 feet 6 inches; spike loose, tapering, 27 inches; flowers large, indigo and purple, eye cream and yellow; spur short; June 20.

98. Lord Curzon (Blackmore & Langdon), XXX July 5, 1917.—Height 5 feet 3 inches; spike fairly crowded, semi-blunt, 16 inches; branch spikes weak, short, numerous; flowers large, dark indigo and dark purple, ultramarine outside; eye cream and yellow; spur short; June 29. Buds very dark, shining. Raised by senders.

39. Lord Rosebery (Barr).—Height 5 feet; spike crowded, rather blunt, 8 inches; flowers of medium size, dull red purple, ultramarine margins; eye sepia and gold; spur short; sparsely hairy; July 7.

113. Marion Riddle (Forbes).—Height 6 feet 6 inches; spike crowded, rather blunt, 15 inches; flowers large, dull purple, indigo margins; eye cream and yellow; spur long, sparsely hairy; July 7. Raised by sender, 1913.

81. Miss Britton (Barr), XX July 5, 1917.—Height 7 feet 6 inches; spike crowded, slightly tapering, 12 inches; flowers of medium size, indigo, suffused purple; eye white and yellow; spur short, sparsely hairy; July 6. Raised by sender.

6. Mme. E. Geny (Wisley).—Height 6 feet 6 inches; spike rather crowded, tapering, 18 inches, branch spikes long, numerous; flowers large, indigo and purple; eye cream and yellow; spur long, sparsely hairy; June 26.

79. Mrs. O'Connor (Baker).—Height 5 feet 6 inches; spike loose, tapering, 24 inches, branch spikes numerous; flowers of medium size, indigo, suffused purple; eye greenish; spur rather short; June 27. Raised by sender.

11. Mrs. Violet Hulton (Baker).—Height 6 feet 3 inches; spike fairly crowded, slightly tapering, 22 inches, branch spikes fairly numerous; flowers large, indigo and purple; eye greenish and white; spur fairly long; June 25. Raised by Mr. Smith.

158. Nerissa (Bunyard).—Height 5 feet 6 inches; spike rather crowded, tapering, 16 inches; flowers of medium size, waved, indigo, faintly streaked light purple; eye yellowish white; spur short; June 12. Raised by sender.

52. Nobilis (Baker), XXX July 20, 1917.—Height 7 feet; spike crowded, tapering, 20 inches, branch spikes fairly numerous; flowers large, indigo, suffused purple more or less; eye greenish white; spur long; July 7.

48. Purple Rod (Kelway).—Height 4 to 6 feet; spike rather crowded, some tapering, some blunt, 18 to 21 inches, branch spikes, some numerous; flowers

dark purple and indigo; eye yellow and white; spur of medium length, some sparsely hairy; June 18. Mixed single and duplex, dark and light in colour. Raised by sender, 1912.

23. Prins Hendrik (Ruys).—Height 4 feet 6 inches; spike fairly crowded, rather blunt, 18 inches; flowers large, purple, indigo margins; eye cream; spur long; July 6.

38. Remarkable (Kelway).—Height 6 feet 6 inches; spike rather crowded, tapering, 24 inches, branch spikes rather numerous; flowers large, indigo, suffused purple, lighter in centre, eye greenish and white; spur short; June 26. Raised by senders.

39. Shyllock (Bunyard).—Height 5 feet 6 inches; spike rather crowded, slightly tapering, 20 inches, branch spikes fairly numerous; flowers large, deep mauve on blue; eye cream and purple; spur long, sparsely hairy; June 26. One plant with broadly-lobed leaves. Raised by senders.

44. Sir Wroth Lethbridge (Kelway).—Height 6 feet; spike fairly loose, tapering, 18 inches, branch spikes rather numerous; flowers large, indigo, much purple at margins, some all purple; eye white and yellow; spur short; June 21. Raised by senders.

56. Stateliness (Barr).—Height 5 feet 6 inches; spike rather crowded, slightly blunt, 11 inches, branch spikes fairly numerous; flowers small, Antwerp blue, extra petals suffused dark purple; eye white and yellow; spur long; buds autumnal, shining; July 7. Raised by sender.

25. 26. The Alake (Ruys, Baker).—Height 6 to 7 feet; spike fairly loose, tapering, 24 inches, branch spikes long, numerous; flowers large, indigo and purple; eye white and greenish; spur rather short; June 26.

15. T. Thomas (Blackmore & Langdon).—Height 4 feet 3 inches; spike loose, tapering, 12 inches, branch spikes fairly numerous; flowers of medium size, indigo and purple; eye yellowish and white; spur of medium length; July 2. Raised by sender.

156. Turquoise (Blackmore & Langdon).—Height 5 feet 3 inches; spike loose, tapering, 22 inches, branch spikes numerous; flowers of medium size, deep sky-blue, suffused purple; eye greenish white; spur fairly long; July 2.

13. Walter T. Ware (Blackmore & Langdon).—Height 6 feet 6 inches; spike fairly loose, tapering, 26 inches, branch spikes long, fairly numerous; flowers large, dull purple tipped indigo; eye whitish; spur of medium length; July 21. Raised by senders.

(2) Eye Dark.

157. Ampère (Blackmore & Langdon).—Height 5 feet; spike crowded, blunt, 14 inches, branch spikes numerous; flowers fairly large, indigo, suffused purple from apex; eye sepia and gold; spur short; July 7. Raised by M. Lemoine.

170. Arago (Lissadell).—Height 4 feet 9 inches; spike fairly loose, tapering, 15 inches, branch spikes numerous; flowers large, indigo, suffused purple at margins; eye purple and cream; spur short, sparsely hairy; June 30. Raised by M. Lemoine.

106. Corry (Ruys), XXX July 5, 1917.—Height 7 feet 6 inches; spike loose, tapering, 36 inches; flowers large, indigo and purple; eye sepia and yellow; spur short, sparsely hairy; June 18. Raised by Mr. F. Koppins.

117. Dusk Monarch (Kelway).—Height 6 feet 6 inches; spike rather crowded, tapering, 19 inches; flowers fairly large, indigo, suffused dull purple; eye sepia and gold; spur fairly long, sparsely hairy; June 27. Raised by senders.

199. Eva (Blackmore & Langdon).—Height 5 feet 6 inches; spike crowded, tapering, 18 inches; flowers large, deep sky-blue, suffused purple; eye sepia and gold; spur of medium length; June 20. Two plants slender and dwarfed. Raised by sender.

183. 184. Harry Smetham (Ruys, Blackmore & Langdon), A.M. July 5, 1917.—Height 6 feet 6 inches; spike fairly loose, tapering, 24 inches, branch spikes numerous; flowers of medium size, indigo, suffused purple centre; eye greenish white; spur short; June 25. Symmetrical flowers of about four whorls. Raised by Messrs. Blackmore & Langdon.

3. Henri Moissan (Blackmore & Langdon).—Height 5 feet 6 inches; spike rather crowded, tapering, 18 inches, branch spikes numerous; flowers large, indigo, much suffused dark purple; eye sepia and yellow; spur long; July 1. Raised by M. Lemoine.

116. In Remembrance (Barr).—Height 6 feet 6 inches; spike crowded, tapering, 18 inches, branch spikes weak, numerous; flowers large, deep indigo, suffused dull purple; eye greenish white; spur long; June 30. Introduced by sender.

71. Jessica (Wisley).—Height 3 feet; spike rather crowded, blunt, 9 inches; flowers small, dull indigo, suffused dull light purple; eye greenish; spur short, sparsely hairy; June 30.

78. J. S. Sargent (Wisley).—Height 5 feet; spike a bit crowded, tapering, 24 inches; flowers of medium size, indigo and dark purple, suffused ultramarine; eye sepia and yellow; spur long; June 25.

110. Lady Nina Balfour (Forbes).—Height 6 feet; spike rather crowded, tapering, 21 inches, branch spikes long, numerous; flowers large, dark indigo, suffused purple; eye sepia and gold (some cream); spur rather short; June 27. Most spikes tend to be fasciated. Raised by senders.

74, 75. Novelty (Blackmore & Langdon, Ruys), XXX July 5, 1917.—Height 5 feet 6 inches; spike crowded, rather blunt, 22 to 30 inches; flowers indigo, suffused purple; eye sepia and gold; spur short; June 30. No. 74 was the best stock. Raised by Messrs. Blackmore & Langdon.

72. Princess Juliana (Barr).—Height 2 feet 4 inches; spike fairly loose, tapering, 18 inches; branch spikes rather numerous; flowers large, ultramarine, suffused dark purple; eye sepia and gold; spur rather short, sparsely hairy; June 25.

128. Progenitor (Forbes).—Height 7 feet; spike loose, tapering, 30 inches; branch spikes fairly numerous; flowers of medium size, indigo, streaked warm purple, lighter centre; eye sepia and gold; spur of medium length; June 25. Raised by sender, 1905.

41, 42. Robert Cox (Barr, Blackmore & Langdon), XXX July 5, 1917.—Height 6 feet 6 inches; spike rather crowded, tapering, 24 inches; flowers of medium size, deep indigo and dark purple; eye sepia and yellow; spur long; June 25. Raised by Messrs. Blackmore & Langdon.

45. Rosalie Ingram (Forbes).—Height 7 feet; spike loose, tapering, 24 inches, branch spikes numerous; flowers large, indigo, suffused purple; eye sepia and gold; spur short, sparsely hairy; June 27. Raised by sender, 1913.

1. Smoke of War (Kelway).—Height 5 feet; spike loose, tapering, 20 inches; flowers of medium size, indigo, much suffused dark purple; eye sepia and yellow; spur of medium length, sparsely hairy; June 26. One plant not true. Raised by sender.

136. Ustane (Barr).—Height 5 feet 6 inches; spike loose, tapering, 22 inches; flowers of medium size, royal blue and purplish centre; eye sepia and yellow; spur of medium length; June 6. One plant dwarf and slender.

18. Zuster Lugten (Ruys).—Height 4 feet; spike rather crooked, loose, tapering, 18 inches, branch spikes rather numerous; flowers fairly large, indigo and dark purple; eye sepia and yellow; spur long, sparsely hairy; June 26. Raised by sender.

C. FLOWERS DOUBLE.

1. White or Yellow.

(1) White.

220. Darius (Wisley).—Height 2 feet 8 inches; spike crowded, blunt, 6 inches; flowers of medium size, cream; eye greenish yellow; spur short; June 27.

(2) Pale Lemon.

224. Fröken Scheltema (Ruys).—Height 2 feet 3 inches; spike fairly loose, blunt, 12 inches; flowers large, pale lemon; eye yellow; spur short, sparsely hairy; June 30. Raised by M. Hemerik.

222. Luna (Baker), XXX July 5, 1917.—Height 4 feet; spike fairly loose, tapering, 18 inches; branch spikes stout, fairly numerous; flowers large, pale lemon; eye yellow; spur short, sparsely hairy; June 27. Raised by Mr. Smith, 1913.

223. Progression (Ruys), XXX July 5, 1917.—Height 4 feet; spike fairly loose, tapering, 18 inches, branch spikes stout, fairly numerous; flowers large, pale lemon; spur short, sparsely hairy; June 25. Rather more double than 222.

II. *Light Blue.*

(1) Eye Light.

80. Ma Mie, syn. Princess Royal (Barr), XXX July 5, 1917.—Height 6 feet 6 inches; spike fairly crowded, tapering, 24 inches; flowers large, indigo and purple; eye greenish; spur long; June 30. Introduced by sender.

151. René Quinton (Blackmore & Langdon).—Height 5 feet; spike fairly crowded, tapering, 12 inches, branch spikes fairly numerous; flowers fairly large, dull sky-blue and white, streaked purple; eye purplish white; spur short, sparsely hairy; July 14. Raised by M. Lemoine.

32. Rev. E. Lascelles (Baker), XXX July 5, 1917.—Height 5 feet 4 inches; spike loose, tapering, 20 inches; branch spikes rather numerous; flowers of medium size, purple with indigo margins; eye white, mottled purple; spur short; June 27.

(2) Eye Dark.

73. King Bladud (Blackmore & Langdon).—Height 5 feet; spike rather crowded, slightly blunt, 12 inches, branch spikes numerous; flowers large, dull purple, Antwerp blue margins; eye purple; spur short; July 6. A sport from Rev. E. Lascelles, raised by Messrs. Blackmore & Langdon.

54. Telegram (Barr).—Height 4 feet; spike rather crowded, crooked, slightly blunt, 12 inches; branch spikes numerous; flowers of medium size, very double, with closely imbricated narrow petals, dull indigo with purple centre; eye yellowish; spur short, sparsely hairy; June 26. Many main spikes crooked, becoming subsidiary to side spikes.

III. *Dark Blue.*

(1) Eye Light.

130. Lieutenant Vasseur (Blackmore & Langdon).—Height 5 feet 4 inches; spike crowded, solid, blunt, 12 inches; flowers of medium size, sky-blue margins, suffused mauve-purple base; spur short; July 7. The most perfect and regular double. Raised by M. Lemoine.

(2) Dark Eye.

85. Diamant (Barr).—Height 5 feet; spike crowded, tapering, 15 inches, branch spikes rather numerous; flowers small, dark indigo and purple; eye dull purple and yellow; spur fairly long; June 18.

MYOSOTIS AT WISLEY, 1917.

ONE hundred and one stocks of *Myosotis* were received for trial at Wisley in 1916. They were sown outdoors in July and transplanted to their permanent quarters 12 x 15 in. apart as soon as large enough. A considerable number failed to germinate, viz. Nos. 4, 6, 13, 19, 22, 26-29, 31, 36, 37, 40-42, 44, 60, 61, 68, 69, 73-75, 78, 82, 98; and of some others but few plants were secured. These are noted below. The winter of 1916-17 was very severe, but almost all stood well and flowered freely in May. In the few cases where damage was done by the winter cold note is made below.

The Floral Committee examined the trial on May 17 and made the following recommendations for awards:

Award of Merit.

No. 82. Indigo Queen, sent by Messrs. Sydenham.

Highly Commended.

Nos. 3, 9, 11, 12, 14. *alpestris stricta*, White Gem, sent by Messrs. Bowers, Carter, Barr, Hurst, and Hurst (for synonyms see descriptions below).

Nos. 15, 16, 17. Perfection Rose, sent by Messrs. Sutton, Barr, and Barr (for synonyms see descriptions below).

No. 23. Pink Gem, sent by Messrs. Sutton.

No. 62. Bouquet Blue, sent by Messrs. Sutton.

No. 63. Blue Eyes, sent by Messrs. R. Veitch.

No. 83. Indigo Queen, sent by Rev. J. Jacob.

No. 87. Royal Blue, sent by Messrs. Sutton.

VARIETIES.*

- | | |
|--|---|
| 1. } Traversii. | 19. } <i>alpestris rosea</i> . |
| 2. } White Pearl. | 20. } <i>alpestris stricta rosea</i> . |
| 3. } Argentina. | 21. } <i>stricta</i> Pink Gem. |
| 4. } <i>dissitiflora alba</i> . | 22. } Pink Gem. |
| 5. } White Lady. | 23. } Bouquet Pink. |
| 6. } <i>robusta grandiflora alba</i> . | 24. } Pyramid Pink. |
| 7. } Pyramid White. | 25. } Welwitschii. |
| 8. } <i>sylvatica alba</i> . | 26. } <i>stricta</i> Tom Thumb. |
| 9. } <i>stricta</i> White Gem. | 27. } <i>alpestris stricta</i> Tom Thumb. |
| 10. } <i>alpestris stricta alba</i> . | 28. } Sky Blue. |
| 11. } <i>alpestris alba</i> . | 29. } Sky Blue. |
| 12. } <i>alpestris alba</i> . | 30. } Sky Blue. |
| 13. } Perfection Rose. | 31. } <i>rupicola</i> . |
| 14. } Victoria Rose. | 32A. } <i>alpestris blue</i> . |
| 15. } Rosy Gem. | 32B. } <i>alpestris Victoria</i> . |
| 16. } <i>sylvatica rosea</i> . | 33. } |
| | 34. } |

* See footnote, p. 107.

| | | |
|---|-------|---|
| 35. <i>alpestris robusta grandiflora</i> . | 68. } | |
| 36. <i>alpestris robusta grandiflora</i> , Improved. | 69. } | <i>azorica</i> . |
| 37. Queen Victoria. | 70. | Azure Blue. |
| 38. } | 71. | Azure Blue, No. 2. |
| 39. } | 72. | Pyramid Blue. |
| 40. Star of Love. | 73. } | |
| 41. } | 74. } | Ruth Fischer. |
| 42. } | 75. } | |
| 43. Dwarf Blue. | 76. } | |
| 44. <i>dissitiflora</i> Blue Gem. | 77. | Warley Blue. |
| 45. } | 78. | Elfriede. |
| 46. } | 79. | <i>stricta</i> Blue Beauty (Pillar For- get-me-not). |
| 47. <i>dissitiflora</i> . | 80. | Blue King. |
| 48. } | 81. | Indigo Blue. |
| 49. <i>dissitiflora</i> (type). | 82. } | |
| 50. <i>dissitiflora</i> . | 83. } | <i>alpestris</i> Indigo Queen. |
| 51. <i>dissitiflora</i> Blue. | 84. } | |
| 52. <i>dissitiflora</i> Perfection. | 85. } | Royal Blue. |
| 53. <i>dissitiflora grandiflora</i> Perfection. | 86. } | |
| 54. Perfection Blue. | 87. } | Royal Blue. |
| 55. <i>sylvatica</i> . | 88. | Royal Blue. |
| 56. <i>sylvatica</i> (type). | 89. | New Double Blue. |
| 57. Alpine Blue. | 90. } | |
| 58. Triumph. | 91. } | <i>palustris</i> (type). |
| 59. Spring Beauty. | 92. } | |
| 60. <i>oblongata</i> perfecta. | 93. } | |
| 61. } | 94. } | <i>palustris</i> <i>semperflorens</i> grandiflora. |
| 62. Bouquet Blue. | 95. } | |
| 63. Blue Eyes. | 96. } | |
| 64. <i>alpestris stricta coelestina</i> . | 97. | Unnamed. |
| 65. } | 98. | Severndroog Turquoise, No. 2. |
| 66. <i>stricta grandiflora</i> . | 99. | Severndroog Dwarf, No. 1. |
| 67. Blue Gem. | 100. | Waterside Beauty. |

I. FLOWERS YELLOW.

1, 2. *Traverstii* (R. Veitch, Barr).—Length 5 inches; spreading flat on soil; foliage narrow, blunt, hispid, dull green; inflorescence close; flowers small, yellow. Began to flower May 29, but heavy rains cut short its flowering period and it soon failed.

II. FLOWERS WHITE.

a. *Habit erect*.

3, 9, 11, 12, 14. *alpestris stricta* White Gem (Bowers, Carter, Barr, Hurst, Hurst), XXX May 17, 1917.—Height 6 to 12 inches; foliage narrow, light yellow green; inflorescence close; flowers $\frac{1}{2}$ inch, white, yellow eye; corolla flat; flowering from May 9. No. 3 was sent in as 'White Pearl,' and 9 as 'Pyramid White,' 12 as *alpestris stricta alba*, and 14 as *alpestris alba*.

b. *Habit spreading*.

5. *dissitiflora alba* (Daniels).—Height 7 to 8 inches; foliage broad, light green; inflorescence long, loose; flowers $\frac{1}{2}$ inch, white, yellow eye, corolla flat, petals deeply lobed; flowering from May 3.

8. *robusta grandiflora alba* (Barr).—Height 8 to 9 inches; foliage narrow, light yellow green; inflorescence close; flowers $\frac{1}{2}$ inch, white, yellow eye; corolla flat; flowering from May 7. Mixed, one blue, some doubles.

10. *sylvatica alba* (Barr).—Height 5 to 6 inches and 9 to 10 inches; foliage of medium width; inflorescence close; flowers $\frac{1}{2}$ inch, white, yellow eye; flowering from May 9. Only two plants, one much more robust with broader leaves.

7. White Lady (Barr).—Height 8 to 9 inches; foliage narrow, light yellow green; inflorescence close; flowers $\frac{1}{2}$ inch, white, yellow eye; corolla flat, petals emarginate; flowering from May 8. Mixed, one blue, one sparingly hairy, some double.

III. FLOWERS PINK.

a. *Habit erect.*

21. *alpestris stricta rosea* (Hurst).—Height 10 to 14 inches; foliage some narrow, some broad; inflorescence spreading; flowers $\frac{1}{2}$ inch, pink, yellow eye; corolla flat; flowering from May 7. Mixed, erect and spreading.

24. Bouquet Pink (Sutton).—Height 8 to 9 inches; foliage narrow; inflorescence spreading; flower $\frac{1}{2}$ inch, pink, yellow eye; corolla flat; flowering from May 7.

15, 16, 17. Perfection Rose (Sutton, Barr, Barr), Nos. 15 and 16 XXX May 17, 1917.—Height 5 to 6 inches; foliage narrow; inflorescence close; flowers $\frac{1}{2}$ inch, pink, yellow eye, dark throat; corolla flat, petals emarginate; flowering from May 7. Some double flowers. No. 17 was rather taller, and sent in as 'Rosy Gem.' No. 16 was sent in as 'Victoria Rose.'

23. Pink Gem (Sutton), XXX May 17, 1917.—Height 9 to 10 inches; foliage narrow; inflorescence close; flowers $\frac{1}{2}$ inch, pink, yellow eye; corolla flat; flowering from May 7. Some double.

25. Pyramid Pink (Carter).—Height 9 to 10 inches; foliage, some narrow, some broad; inflorescence spreading; flowers $\frac{1}{2}$ inch, pink, yellow eye; corolla flat; flowering from May 9.

b. *Habit spreading.*

20. *alpestris rosea* (Hurst).—Height 8 to 12 inches; foliage broad; inflorescence spreading; flowers $\frac{1}{2}$ inch, pink, yellow eye; corolla flat; flowering from May 5. Same becoming pale blue.

18. *sylvatica rosea* (Barr).—Height 8 to 12 inches; inflorescence spreading; flowers $\frac{1}{2}$ inch, pink, yellow eye; corolla flat; flowering from May 5. One white, some becoming light blue.

IV. FLOWERS PALE BLUE.

a. *Habit erect.*

64, 65. *alpestris stricta coelestina* (Hurst, Barr).—Height 10 to 12 inches; foliage broad; inflorescence spreading; flowers $\frac{1}{2}$ inch, sky blue, yellow eye; corolla flat; flowering from May 7. No. 64 was taller, some spreading, and the flowers were pink, becoming sky blue.

67. Blue Gem (Sutton).—Height 8 to 13 inches; foliage, some broad, some narrow; inflorescence close; flowers $\frac{1}{2}$ inch, sky blue, yellow eye, dark throat; corolla flat, petals emarginate; flowering from May 7. Mixed, some erect, some spreading.

62. Bouquet Blue (Sutton), XXX May 17, 1917.—Height 12 inches; foliage narrow; inflorescence spreading; flowers $\frac{1}{2}$ inch, sky blue, yellow eye; corolla flat; flowering from May 5.

54. Perfection Blue (Sutton).—Height 8 to 9 inches; foliage broad; inflorescence close; flowers $\frac{1}{2}$ inch, sky blue, yellow eye, dark throat; corolla flat; flowering from May 7. Some double.

72. Pyramid Blue (Carter).—Height 12 to 14 inches; foliage broad; inflorescence spreading; flowers pink, then sky blue, yellow eye; flowering from May 5. Mixed, some erect, some spreading.

66. *stricta grandiflora* (Barr).—Height 7 to 11 inches; foliage broad; inflorescence close; flowers $\frac{1}{2}$ inch; pink, then sky blue, yellow eye, dark throat; corolla flat, petals emarginate; flowering from May 7. Mixed; a few double, one white, some erect, some spreading.

b. *Habit spreading.*

32A, 32B. *alpestris* Blue (Hurst, Sydenham).—Height 10 to 13 inches; foliage broad; inflorescence spreading; flowers $\frac{1}{2}$ inch, pink, then sky blue, yellow eye; corolla flat; flowering from May 5. No. 32B was sent in as 'Victoria.'

33, 34, 35, 38. *alpestris* Victoria (Hurst, R. Veitch, Hurst, Barr).—Height 8 to 12 inches; foliage broad; inflorescence close; flowers $\frac{1}{2}$ inch, sky blue, yellow eye, dark throat; corolla flat, petals emarginate; flowering from May 7. No. 33 had some double, but mixed with *stricta*; and No. 34 had four spreading rogues. No. 35 was more pink when young; sent in as *robusta grandiflora*.

45, 46, 47, 48, 49, 50, 51. *dissitiflora* (Carter, Barr, R. Veitch, Sydenham, Hurst, Daniels, Sutton).—Height 9 to 10 inches; foliage broad, light green.

inflorescence, long, loose; flowers $\frac{3}{4}$ inch, pinkish, then sky blue, yellow eye; corolla flat, petals deeply lobed; flowering from May 5. No. 49 was sent in as the type, and was the best stock.

52, 53. *dissitiflora* Perfection (R. Veitch, Barr).—Same as Nos. 45 to 51, but No. 53 suffered a good deal from frost.

41. Dwarf Blue (Sutton).—Dwarf, height 5 to 6 inches; foliage broad, dark shining green; inflorescence close; flowers $\frac{1}{2}$ inch, pinkish, then light sky blue, yellow eye, dark throat, becoming whitish; corolla concave; flowering from May 7.

90, 91, 92, 93, 94, 95, 96. *palustris* (Hurst, Barr, Barr, Carter, R. Veitch, Daniels, Hurst).—Height 18 to 24 inches; foliage smooth, with few appressed hairs; inflorescence spreading; flowers pinkish, then sky blue, yellow eye; petals sometimes emarginate; flowering from May 26. Nos. 92 and 95 were rather dwarfer. No. 94 rather more slender in stem. Stocks 90 and 91 were sent in as the type, and Nos. 92, 93, 94, 95, 96 as semperflorens.

76. Ruth Fischer (R. Veitch).—Same as No. 45 to 53, but of dwarfier habit.

99. Severndroog Dwarf No. 1 (Bartleet).—Dwarf like No. 76.

30. Sky Blue (Daniels).—Height 12 inches; foliage broad; inflorescence close; flowers $\frac{1}{2}$ to $\frac{3}{4}$ inch; sky blue, yellow eye; corolla flat, petals emarginate; flowering from May 7. Mixed, some pinkish, some double, some spreading.

59. Spring Beauty (Barr).—Height 9 to 10 inches; foliage broad; inflorescence spreading; flowers $\frac{1}{2}$ inch, pinkish, then sky blue, yellow eye; corolla concave; flowering from May 7.

39. Star of Love (Daniels).—Dwarf, as 76 and 92.

55. *sylvatica* (R. Veitch).—Height 9 to 10 inches; foliage broad; inflorescence close; flowers $\frac{3}{4}$ inch, pink, then sky blue, yellow eye, dark throat; corolla flat, petals emarginate; flowering from May 9. Mixed, some spreading, some decumbent, some double, one white.

56. *sylvatica* type (Barr).—Height 9 to 10 inches; foliage broad; inflorescence spreading; flowers $\frac{1}{2}$ inch, pink, then sky blue, dark throat; corolla flat; flowering from May 9. One plant with narrower leaves.

58. Triumph (Barr).—Height 8 to 12 inches; foliage broad; inflorescence close; flowers $\frac{1}{2}$ inch; pink, then sky blue, yellow eye, dark throat; corolla flat, petals emarginate; flowering from May 9. Mixed, one white, two pink, some double.

100. Waterside Beauty (Bartleet).—Height 9 to 10 inches; foliage broad; inflorescence spreading; flowers $\frac{1}{2}$ inch, pink, then sky blue, yellow eye; corolla flat; flowering from May 7. Two white and one erect rogue.

V, FLOWERS DEEP BLUE.

Habit spreading.

57. Alpine Blue (Barr).—Height 12 to 13 inches; foliage broad; inflorescence spreading; flowers $\frac{1}{2}$ inch, pink, then indigo, yellow eye, dark throat; corolla concave; flowering from May 5.

70, 71. Azure Blue (Dobbie, Dobbie).—Height 9 to 11 inches; foliage broad; inflorescence spreading; flowers pink, then indigo, yellow eye; corolla flat; flowering from May 5. No. 71 had one plant dwarfier with deep pinkish flowers.

63. Blue Eyes (R. Veitch), XXX May 17, 1917.—Height 14 inches; foliage broad; inflorescence spreading; flowers $\frac{3}{4}$ inch, indigo, yellow eye; corolla flat; flowering from May 5.

80. Blue King (Barr).—Height 11 to 12 inches; foliage broad; inflorescence spreading; flowers indigo, yellow eye; corolla concave, petals emarginate; flowering from May 5. One plant sky blue with close inflorescence, and one pinkish blue.

81. Indigo Blue (Daniels).—Height 11 to 12 inches; foliage broad; inflorescence spreading; flowers indigo, yellow eye, dark throat; corolla concave, petals emarginate; flowering from May 5. Mixed, one lilac white, one very pale blue; some double.

82, 83. Indigo Queen (Sydenham, Jacob), No. 82 A.M. and No. 83 XXX May 17, 1917.—Height 11 to 12 inches; foliage broad; inflorescence spreading; flowers pink, then indigo, yellow eye, dark throat; corolla concave, petals emarginate; flowering from May 5. No. 83 had one sky blue rogue.

84, 85, 86, 87, 88. Royal Blue (Carter, R. Veitch, Hurst Sutton, Bell), No. 7, XXX May 17, 1917.—Height 10 to 12 inches; foliage broad; inflorescence spreading; flowers pink, then indigo, yellow eye; corolla concave, petals emarginate; flowering from May 5. No. 87 was the dwarfier stock.

79. *stricta* Blue Beauty (Barr).—Height 9 to 11 inches; foliage broad; inflorescence close; flowers $\frac{1}{2}$ inch, indigo, yellow eye, dark throat; corolla flat, petals emarginate; flowering from May 7. Mixed, one pink, one white, one almost lavender, some double.

97. Unnamed (Tennant).—Height 11 to 12 inches; foliage broad; inflorescence spreading; flowers pink, then indigo, yellow eye, dark throat; flowering from May 5. One plant with close inflorescence.

77. Warley Blue (Barr).—Height 9 to 13 inches; foliage broad; inflorescence spreading; flowers $\frac{1}{2}$ inch, indigo, yellow eye; corolla concave, some with petals emarginate; flowering from May 5.

ANNUAL POPPIES AT WISLEY, 1917.

FIFTY-SIX stocks of annual poppies were received for trial at Wisley, in 1917. They were sown on March 27 in beds 6 feet wide with a distance of 15 inches between the rows. As soon as large enough they were thinned out to 9 inches apart in the rows. The soil had been deeply dug but no manure was applied. The plants filled the space given them completely and flowered well in June. The species represented included *Papaver somniferum*, *P. Rhoeas*, *P. pavoninum*, *P. umbrosum*, and *P. glaucum*. One sent in as *P. laevigatum* proved to be *P. Rhoeas* only. The *P. somniferum* forms were the first to flower and the soonest over.

The Floral Committee examined the trial on two occasions, and made the following recommendations for awards :

Award of Merit.

21. Dwarf Scarlet Fringed, sent by Messrs. R. Veitch.
20. Scarlet King, sent by Messrs. Barr.

Highly Commended.

24. Cardinal Blush, sent by Messrs. Dobbie.
25. Cardinal Scarlet, sent by Messrs. Dobbie.
5. Dainty Lady, sent by Messrs. Barr.
7. Danebrog, sent by Messrs. Barr.
52. *Papaver pavoninum*, sent by Messrs. Barr.
13. Dwarf double Paony-flowered mixed, sent by Messrs. Barr.
- 37, 38. New Double Queen, sent by Messrs. Barr, and R. Veitch.
- 50, 51. *Papaver umbrosum*, sent by Messrs. Dobbie and Barr.
4. The Admiral, sent by Messrs. Barr.
14. White Colossal, sent by Messrs. Barr.
15. White Swan (or Snowdrift) sent by Messrs. Barr.

Commended.

43. Picotee, sent by Messrs. Barr.

Of the forms to which awards were recommended in this trial *P. umbrosum* received F.C.C. when sent by Messrs. Benary in 1880. *P. somniferum* 'Cardinal White,' *P. glaucum*, and *P. Rhoeas* 'Shirley Poppies,' which had all received awards in past years, were represented, but the strains shown did not commend themselves to the Committee.

VARIETIES.*

- | | |
|---------------------------------------|---------------------|
| 1. The Bride (syn. Maid of the Mist). | 6. Victoria Cross. |
| 2. Virginian Fringed. | 7. Danebrog. |
| 3. Miss Sherwood. | 8. King Edward. |
| 4. The Admiral. | 9. Black Prince. |
| 5. Dainty Lady. | 10. Charles Darwin. |

* See footnote, p. 107.

11. Giant Carnation-flowered Double Mixed.
12. Giant Pæony-flowered Double Mixed.
13. Dwarf Double Pæony-flowered Mixed.
14. White Colossal.
15. White Swan (syn. Snowdrift).
16. Snowball.
17. Mikado.
18. Pæony-flowered Double Rose Brilliant.
19. Fireball.
20. Scarlet King.
21. Dwarf Scarlet Fringed.
22. The Cardinal.
23. Cardinal White.
24. Cardinal Blush.
25. Cardinal Scarlet.
26. Carnation-flowered.
27. Japanese Pompon.
28. Dwarf Pæony-flowered Snowball.
29. Cardinal Chamois.
30. Munstead Cream Pink.
31. Dwarf Rosy Pink.
32. No. 1 White Rose-edged.
33. Annual Shirley Poppies, Double.
34. The Shirley.
35. French Dwarf Double, or Ranunculus-flowered.
36. Hybrids Salmon and Orange Stark's.
37. New Double Queen.
38. Begonia-flowered.
39. Begonia-flowered.
40. Mixed Pompon, Rose and Salmon Stark's.
41. Japanese Pompon, Mixed.
42. Shirley Picotee.
43. Picotee.
44. Rose and Pink Shades.
45. Shirley Poppy.
46. Raynes Park Hybrids.
47. Shirley.
48. Shirley.
49. umbrosum.
50. umbrosum or Fire Dragon.
51. Peacock Poppy (*P. pavoninum*).
52. Scarlet Tulip.
53. Scarlet Tulip (*P. glaucum*).
54. Scarlet Tulip.
55. Tulipa taevigatum (The Persian Poppy).

PAPAZER SOMNIFERUM GROUP.

A. Single.

(a) *White*.

1. The Bride (Maid of the Mist) (Barr).—Height, 3 feet; flower, 2½ to 3 inches, white; July 2.

(b) *White, margined pink*.

2. Virginian Fringed (Barr).—Failed.

3. Miss Sherwood (Barr).—Height, 2 feet 6 inches; flower, 3½ to 4 inches, light pink, with ivory white base; July 2.

(c) *Scarlet, white base*.

7. Danebrog (Barr), XXX July 5, 1917.—Height, 3 feet 6 inches; flower, 4 inches, scarlet with white cross at base; July 2. Very like No. 4.

4. The Admiral (Barr), XXX July 5, 1917.—Height, 4 feet; flower, 4 inches, scarlet with white cross at base; July 28.

6. Victoria Cross (Barr).—Height, 3 feet 6 inches; flowers, 5 inches, light scarlet with white cross; July 26. A very mixed stock.

(d) *Scarlet, purple-black base*.

8. King Edward (Barr).—Height, 3 feet 6 inches; flower, 4 inches; scarlet-purple-black base; July 2. Mixed, some lurid purple with black base.

(e) *Light pinkish purple*.

5. Dainty Lady (Barr), XXX July 5, 1917.—Height, 3 feet; flower, 3 inches, light pinkish purple, with dark purple base held well above foliage; June 18.

(f) *Dark velvety purple, fringed*.

9. Black Prince (R. Veitch).—Height, 2 feet 9 inches; flower, 3 to 3½ inches, dark velvety purple, fringed, July 2.

(B) *Single and Double*.

10. Charles Darwin (Barr).—Height, 3 feet to 3 feet 6 inches; flower, 3½ inches, mostly dull red purple, dark purple-streaked blotch; June 21. Mixed with white and lighter colours.

11. Giant Carnation-flowered Double Mixed (Barr).—Height, 3 feet 6 inches; flowers, 5 inches, fringed; June 26. Mixed, black purple with deep scarlet fringe, white with puce and scarlet fringe.
12. Giant Pæony-flowered Double Mixed (Barr).—Height, 3 feet 6 inches; flowers, 4 to 5½ inches, mauve-white to deep carmine, some coarsely fringed; June 22.

C. Double.

(a) *White*.

23. Cardinal White (Dobbie).—Height, 2 feet 6 inches; flower, 3 to 4½ inches, some white, more or less fringed; June 28. Mixed single and double, some lemon and plain margins.
19. Fireball (Barr).—Height, 3 feet; flower, 3½ to 4½ inches; June 27. Good white, wrongly named, sent in as scarlet, pæony-flowered.
14. White Colossal (Barr), XXX July 5, 1917.—Height, 3 feet 6 inches; flower, 5 inches; June 21. Pæony-flowered, with three mauve rogues and one flesh-pink.
15. White Swan (syn. Snowdrift) (Barr), XXX July 5, 1917.—Height, 2 feet 6 inches; flower, 3 to 4 inches, fringed; July 2.
10. Snowball (Barr).—Failed.
26. Dwarf Pæony-flowered Snowball (R. Veitch).—Failed.

(b) *White, Red edges*.

17. Mikado (Barr).—Height, 2 feet; flower, 4 inches, white, red edges, fringed; July 10.

(c) *Flesh Pink*.

24. Cardinal Blush (Dobbie), XXX July 5, 1917.—Height, 18 inches; flower, 3½ inches, pink, yellowish base, fringed; July 2. Good dwarf stock.
31. Dwarf Rosy Pink (R. Veitch).—Height, 3 feet 6 inches; flower, 4 to 4½ inches, pink to scarlet, fringed; June 26. Very mixed, white and mauve-purple.
39. Munstead Cream Pink (Carter).—Height, 3 feet; flower 4½ to 5 inches, pink and flesh-pink, July 2. Pæony-flowered.
18. Pæony-flowered Double Rose Brilliant (Barr).—Height, 2 feet 6 inches; flower, 5 inches, flesh-pink, creamy centre; June 26. Mixed and variable.

(d) *Scarlet*.

25. Cardinal Scarlet (Dobbie), XXX July 5, 1917.—Height, 2 feet; flower, 3½ inches, fringed; July 2. Dwarf and true.
21. Dwarf Scarlet Fringed (R. Veitch), A.M. July 5, 1917.—Height, 2 feet 9 inches; flower, 4 to 5 inches, fringed; June 27.
20. Scarlet King (Barr), A.M. July 5, 1917.—Height, 3 feet 6 inches; flower, 4½ to 5 inches; July 2. Pæony-flowered.
22. The Cardinal (Barr).—Height, 2 feet 9 inches; flower, 4 to 5 inches, fringed; June 27. Not true; pink with white base rogue.

(e) *Chamois*.

29. Cardinal Chamois (Dobbie).—Height, 2 feet 6 inches; flower, 4 to 5 inches, fringed; June 30. Mixed, lighter and darker in colour.

(f) *Mixed*.

25. Carnation-flowered (Sydenham).—Height, 3 feet; flower, 3½ to 4½ inches, fringed, from light pink, mauve-purple to scarlet; June 28.
17. Dwarf Double Pæony-flowered Mixed (Barr), XXX to strain, July 5, 1917.—Height, 2 feet 6 inches; flower, 5 inches, white, cerise, vermilion to scarlet; June 21. Dwarf habit, pæony-flowered.

PAPAYER RHOEAS GROUP

A. Single.

(a) *White, Crimson margins.*

43. Picotee (Barr), XX July 5, 1917.—Height, 2 feet 6 inches; flower, 4 inches; June 26. True stock.

(b) *Mixed.*

46. Raynes Park Hybrids (Carter).—Height, 2 feet 3 inches; flower, 3 to 4 inches, white to scarlet; June 21. Worth further selecting for smoky grey (blue) stock.
47. Shirley (R. Veitch).—Height, 2 feet 6 inches; flower, 3½ to 4 inches, white pinkish white, purplish cerise, vermillion with white margins; June 26.
48. Shirley (Dobbie).—Height, 2 feet 6 inches; flower, 3 to 4 inches, white, pink, blush, cerise, purple-mauve with crimson margin; June 20. True Shirley Poppy.
42. Shirley Picotee (R. Veitch).—Height, 2 feet; flower, 4 inches, picotee narrow and broad margins, some white; June 26. Dwarf.
45. Shirley (Barr).—Height, 2 feet 6 inches; flower, 3½ to 4 inches, pink with white margin, cerise, deep pink streaked darker, mauve with crimson margins; June 21. One rogue, scarlet with black blotch.
49. The Shirley (Sydenham).—Height, 2 feet 6 inches; flower, 3 to 4 inches, white to scarlet, some with white base and margin; June 26.

B. Semi-Double and Double.

(a) *Cerise.*

39. Begonia-flowered (Stark).—Height, 2 feet; flower, 3½ to 4 inches; June 26. Nice flower, good stock. Dwarf.

(b) *Mixed.*

54. The Shirley (Simpson).—Height, 2 feet 6 inches; flower, 4 inches, pink to scarlet, some with white base and margin; June 20. One rogue with black blotch.

(C) Single and Double.

35. French Dwarf Double or Ranunculus-flowered (Barr).—Height, 2 feet 6 inches; flower, 4½ inches, vermillion with white edges, deep scarlet, and deep shining scarlet with black blotch and white edges; June 21. Tall, not dwarf.
36. Hybrids Salmon and Orange (Stark).—Height, 2 feet to 2 feet 6 inches; flower, 3 to 4 inches; pinkish white, some suffused salmon, cerise, very light mauve, vermillion; June 18. Requires further selecting, contains rose.
- 37, 38. New Double Queen (Barr, R. Veitch), XXX July 5, 1917.—Height, 2 feet to 2 feet 6 inches; flower, 3½ to 4 inches, white, salmon, scarlet, some with scarlet and purple margins and lighter centres; June 18. Good flower, some frilled.
32. No. 1 White, rose-edged (Lansdell).—Height, 2 feet 3 inches; flower, 4 inches, deep scarlet, crimson with whitish base, deep pink whitish base; June 26. Very mixed, requires selecting.
27. Japanese Pompon (R. Veitch).—Height, 2 feet 3 inches; flower, 4 inches, scarlet with white margin, white with light purplish centre and margin, scarlet with mauvy margin; June 21. Pæony-flowered Shirley.
44. Rose and Pink Shades (Stark).—Height, 2 feet 3 inches; flower, 3 to 4 inches, light flesh pink white margins, cerise, salmon, white flushed salmon; June 21.
33. Shirley Strain (Lansdell).—Height, 2 feet 3 inches; flower, 4 inches, white with light crimson edges, scarlet with white edges, white heavily suffused salmon; June 26. Many single.

* To this group belong the beautiful Shirley Poppies, selected with such taste and distributed with such generosity by the Society's Secretary, Rev. W. White. His strain received F.C.C. July 2, 1901.

Since they readily cross with the wild form they need constant roguing and isolation if they are to be kept true.

(D) Double.

40. Mixed Pompon Rose and Salmon (Stark).—Height, 2 feet; flower, 2½ to 3 inches, verise, light scarlet broad white margins, light salmon, pinkish white flush, some suffused deeper; June 21. Dwarf.
41. Japanese Pompon Mixed (Barr).—Height, 2 feet; flower, 2½ to 3 inches, all colours; July 7. A few single.

PAPAVER UMBROSUM (Fire Dragon Poppy).

- 50, 51. Umbrosum (Dobbie, Barr), XXX July 5, 1917.—Height, 2 feet; flower, 2 inches, rich shining scarlet with black blotch (sometimes with grey margins); June 20. The grey should be selected out. In No. 51 the blotches were a little smaller.

PAPAVER PAVONINUM (The Peacock Poppy).

52. Peacock Poppy (Barr), XXX July 5, 1917.—Height, 2 feet to 2 feet 6 inches, habit rather straggling; flower, 2 to 2½ inches, orange-scarlet with black ring near base; June 12.

PAPAVER LAEVIGATUM (The Persian Poppy).

- 53, 54, 55, 56. Scarlet Tulip (Sydenham, Barr, R. Veitch, R. Veitch).—The smooth *P. laevigatum* was conspicuous by its absence, as there were only three or four plants of it in stocks, Nos. 53 and 54. No. 53 was very mixed, 54 and 55 were wrong, and 56 consisted of *P. Rhoeas* only.

SPRING-SOWN BEET AT WISLEY, 1917.

SEVENTY-THREE stocks of beet were sent in for spring-sowing in 1917. They were all sown on May 9 on ground which had carried late potatoes in the previous year, after which mustard had been sown and dug in in early September. No manure had been applied to this plot since 1914. The drills were 18 inches apart, and the plants were thinned to 8 inches apart in the rows on June 12. All the stocks germinated well and made excellent growth. Mr. Wright, the Superintendent, and Mr. J. Wilson, Fruit Foreman, were responsible for the cultivation. The Fruit and Vegetable Committee judged the early varieties Nos. 1 to 21, on July 27 and the remainder on September 28, and made the following recommendations for awards:

First-class Certificate.

No. 41. Green-top, Sutton's Strain (Sutton).

Award of Merit.

No. 45. Cheltenham Green-top (Sydenham).

38. Covent Garden Compact Top (Barr), which the Committee considered identical with Dewar's Northumberland Red.

57. Exhibition, Brydon's (Barr).

2. Globe, Sutton's Strain (Sutton).

36, 37. Northumberland Red, Dewar's (Barr, Nutting).

49. Perfection, Sutton's (Sutton).

53. Selected Red, Nutting's (Nutting).

3. Turnip-shaped, Dewing's (Barr).

Highly Commended (XXX).

No. 19. Egyptian, Crosby's (Barr).

67, 68, 69. Deep Blood-red Non-bleeding (McLennan, R. Veitch Bell).

65. Black, Sutton's (Sutton).

66. Purple, Dobbie's (Dobbie).

The Committee considered Nos. 65 and 66 to be identical

48. Market Favourite (Sutton).

9. Selected Globe (Dobbie).

29. Intermediate, Veitch's (Sutton).

73. Nonpareil Red, Yates' (Barr).

Commended (XX).

No. 11. Crimson Globe (Notcutt).

52. Exhibition, Pragnell's (Barr).

31. Perfection, Carter's (Carter).

23. Queen of the Blacks (Barr).

Of the foregoing, Cheltenham Green-top had received A.M. in 1916 when sent by Messrs. Watkins & Simpson, J. Veitch, Yates, and Nutting; Globe in 1908 when sent by Messrs. Sutton; and Nutting's Selected Red in 1908 when sent by Messrs. Barr, Carter, and J. Veitch.

One of the most marked differences in the varieties under trial was the relative size of the tops and of the space occupied by the plants. Several varieties with very large tops had roots no larger and no better in any way than others with small compact tops which would occupy less space in the garden. The Committee paid special attention to this point in recommending awards.

The question of the harm done by cutting or breaking the root or brading the skin before cooking was raised by the variety sent in under the name of 'Deep Blood-red Non-bleeding Beet,' Nos. 67, 68, 69. Trial showed that though a certain amount of the red colour was lost from the root when it was cut into three or four pieces before boiling, yet its colour was still good afterwards, and it was also found that other well-coloured varieties might be cut before boiling with little detriment to the colour; whether the pieces were first put into cold or into boiling water made little difference. Such cutting led to some loss of sugar in the cooking and, therefore, to a slight reduction in the food value.

Two yellow-rooted varieties, No. 1, a round early one, and No. 70, a long one, were included in the trial and both would doubtless provide valuable food.

The great food value of garden beet seems little recognized, and at times like the present, when all food is valuable, they should be much more frequently used as vegetables than they are. The yield from a given area is very high, greater perhaps than that of any other vegetable when large roots are grown, and the food value per pound also high.

VARIETIES.

| | | |
|------------------------------------|-----|-------------------------------------|
| • Early Golden Globe. | 28. | } Intermediate, Veitch's. |
| • Sutton's Globe. | 29. | |
| • Turnip-shaped. | 30. | } Queen Mary. |
| • Lentz Red Turnip. | 31. | |
| • Early Model Globe. | 32. | } Perfection, Carter's. |
| • Early Red Globe. | 33. | |
| • Early Red Globe. | 34. | } Crapaudine. |
| • Early Crimson Globe. | 35. | |
| • Selected Globe. | 36. | } Massy. |
| • Model Globe. | 37. | |
| • Crimson Globe. | 38. | } Northumberland Red. |
| • Crimson Ball. | 39. | |
| • Defiance Dark Red Turnip-rooted. | 40. | } Covent Garden Compact Top. |
| • Blood-red Turnip-rooted. | 41. | |
| • Detroit. | 42. | } Intermediate, E. W. King's No. 1. |
| • Bassano. | 43. | |
| • Egyptian, Turnip-rooted. | 44. | } Intermediate, E. W. King's No. 2. |
| • Early Flat Egyptian. | 45. | |
| • Egyptian, Crosby's. | 46. | } Green Top. |
| • Early, Edmond's. | 47. | |
| • Columbia. | 48. | } Favourite. |
| • Strasburg Dark Red. | 49. | |
| • Queen of the Blacks. | 50. | } Cheltenham Green Leaf. |
| • Victoria. | 51. | |
| • Crimson Model Pear-shaped. | 52. | } Cheltenham Green Top (selected). |
| • Dainty. | 53. | |
| | | } Cheltenham Green Leaved. |
| | | |
| | | } Pine Apple. |
| | | |
| | | } Pine Apple. |
| | | |
| | | } Market Favourite. |
| | | |
| | | } Sutton's Perfection. |
| | | |
| | | } Non Plus Ultra. |
| | | |
| | | } St. Osyth. |
| | | |
| | | } Exhibition, Pragnell's. |
| | | |
| | | } Selected Red, Nutting's. |
| | | |

See footnote p. 107.

- | | |
|-----------------------------|-----------------------------------|
| 54. Dwarf Red, Nutting's. | 64. Middleton Park Favourite. |
| 55. Improved Crimson. | 65. Black, Sutton's. |
| 56. Superb Red. | 66. Purple, Dobbie's. |
| 57. Exhibition, Brydon's. | 67.) |
| 58. Purple Top, Cattell's. | 68.) Deep Blood-red Non-bleeding |
| 59. Blood Red. | 69.) |
| 60. Black, Goldie's. | 70. Long Sweet Yellow. |
| 61. Black Leaved, Dell's. | 71. Willow-leaved. |
| 62. Crimson Leaved, Dell's. | 72. Obelisque Red. |
| 63. Black, Whyte's. | 73. Nonparcil Red. |

DESCRIPTIONS.

I. YELLOW-FLESHED VARIETIES.

(a) *Roots Round.*

1. **EARLY GOLDEN BALL** (Barr).—Root 5 inches deep, 3 to 3½ inches diameter; globular, tapering; skin dull brown, smooth; flesh yellow with distinct orange zones and little core; growth rather spreading; leaves many, large, broad, smooth, light shining green, tinged yellowish. Stock even.

(b) *Roots Long.*

70. **LONG SWEET YELLOW** (Barr).—Root 14 inches long, 2½ to 3½ inches diameter; cylindrical; skin orange yellow, some reddish, more or less smooth three-fourths root above soil; flesh yellow, zones fairly distinct, little core; growth upright; leaves many, large, broad, shining, yellow-green. True stock but roots rather irregular in shape.

II. RED-FLESHED VARIETIES.

(a) *Roots Round.*1. *Foliage more or less Green.*

14. **BLOOD-RED TURNIP-ROOTED** (Barr).—Root 4 inches deep, 3 to 4 inches diameter; globular; skin dull red, slightly rough; flesh dark red, zones distinct, little core; growth upright; leaves many, large, broad, some crumpled, shining, dark green, much tinged purple. One bolted.

11. **CRIMSON GLOBE** (Notcutt), XX July 27, 1917.—Root 4 inches deep, 3 to 3½ inches diameter; globular, tapering, sometimes abruptly; skin dull red, slightly rough; flesh dark red, zones fairly distinct, little core; growth upright; leaves fairly numerous, large, broad, smooth, some crumpled, shining, dark green, much tinged purple. One bolted.

13. **DEFIANCE DARK RED TURNIP-ROOTED** (Barr).—Root 3½ inches deep, 3 to 4 inches diameter; globular, tapering abruptly; skin dull red, slightly rough; flesh dark red, zones fairly distinct, little core; growth upright; leaves many, large, broad, some crumpled, shining, dark green, tinged purple, skin bronze.

15. **DETROIT** (Barr).—Plant 3½ inches deep, 2½ to 3½ inches diameter; globular, tapering, sometimes abruptly; skin dull red, slightly rough; flesh dark red, zones distinct, sometimes white, core rather pronounced; growth upright; leaves many, large, broad, some crumpled, shining, dark green, tinged purple. Stock not true for root-shape.

3. **DEWING'S TURNIP-SHAPED** (Barr), A.M. July 27, 1917.—Root 5½ inches deep, 3 to 3½ inches diameter; globular, tapering, sometimes abruptly; skin dull red, slightly rough; flesh brilliant, dark red, zones fairly distinct, little core; growth upright; leaves many, large, broad, smooth, shining, dark green, tinged purple.

8. **EARLY CRIMSON GLOBE** (Nutting).—See Early Red Globe.

5. **EARLY MODEL GLOBE** (Sydenham).—Root 4½ inches deep, 3 to 3½ inches diameter; globular, tapering, sometimes abruptly; skin dull red, slightly rough; flesh dark red, sometimes distinctly zoned with white, little core; growth upright; leaves large and fairly numerous, broad, crumpled, shining, dark green, much tinged purple. Stock not true for length.

6. **EARLY RED GLOBE IMPROVED** (Barr).—See next.

6, 7, 8. **EARLY RED GLOBE** (Barr, R. Veitch, Nutting).—Root 4 inches deep, 3 to 4 inches diameter; globular, tapering, sometimes abruptly; skin dull red, slightly rough; flesh dark red, zones fairly distinct, little core; growth

upright; leaves many, large, broad, smooth, some crumpled, shining, dark green, some tinged purple. No. 6 was more bronze than 7 and 8. Nos. 7 and 8 were mixed, some inclined to half-long.

2. **GLOBE** (Sutton), A.M. 1908.—Root $4\frac{1}{2}$ inches deep, $2\frac{1}{2}$ to 3 inches diameter; globular, tapering abruptly; skin dull red, slightly rough; flesh brilliant dark red, zones fairly distinct, little core; growth upright; leaves rather few, of medium size, smooth, shining, dark green, much tinged purple.

4. **LENTZ RED TURNIP** (Barr).—Root 4 inches deep, 3 to $3\frac{1}{2}$ inches diameter; globular, tapering; skin dull red, slightly rough; flesh red, more or less distinctly zoned with white, little core; leaves many, large, broad, rather spreading, smooth, shining, light green, little tinged purple. One bolted.

10. **MODEL GLOBE** (Simpson).—Root variable in size, $2\frac{1}{2}$ to $3\frac{1}{2}$ inches deep, $2\frac{1}{2}$ to $3\frac{1}{2}$ inches diameter; globular, tapering, sometimes abruptly; skin dull red, slightly rough; flesh dark red, zones fairly distinct, little core; growth upright; leaves many, large, broad, crumpled, shining, dark green, much tinged purple, some bronze.

9. **SELECTED GLOBE** (Dobbie), XXX July 27, 1917.—Root 4 inches deep, $3\frac{1}{2}$ to 4 inches diameter; globular, tapering, sometimes abruptly; skin dull red, slightly rough; flesh dark red, zones fairly distinct, little core; growth upright; leaves of medium size and width, smooth, some crumpled, shining, dark green, much tinged purple.

2. Foliage Bronze.

12. **CRIMSON BALL** (Carter).—Root $2\frac{1}{2}$ to 3 inches deep, $2\frac{1}{2}$ to 3 inches diameter; globular, tapering, sometimes abruptly; skin dull red, slightly rough; flesh dark red, with distinct zones, sometimes distinctly zoned with white, little core; growth upright; leaves many, large, broad, crumpled, shining, bronze.

(b) Roots Flat Round.

16. **BASSANO** (Barr).—Root 3 inches deep, $3\frac{1}{2}$ to 4 inches diameter; skin deep red, fairly smooth; flesh red, zones distinct, some white, little core; growth rather spreading; leaves medium to large, broad, shining, yellow-green, little tinged purple.

21. **COLUMBIA** (Barr).—A mixed stock.

19. **CROSBY'S EGYPTIAN** (Barr), XXX July 27, 1917.—Root 2 inches deep, $3\frac{1}{2}$ to 4 inches diameter; skin deep red, fairly smooth; flesh dark red, zones fairly distinct, little core; growth upright; leaves many, medium to large, shining, dark green, more or less tinged purple.

18. **EARLY FLAT EGYPTIAN** (Barr).—Root 3 inches deep, 3 to 4 inches diameter; flat round, some tapering; skin deep red, fairly smooth; flesh dark red, zones distinct, some white; growth upright; leaves fairly numerous, medium to large, broad, some crumpled, shining, dark green, some much tinged purple. Variable in size, some bronze, some globular.

20. **EDMOND'S EARLY** (Barr).—Root 4 inches deep, $3\frac{1}{2}$ to $2\frac{1}{2}$ inches diameter; flat round, some tapering; skin deep red, fairly smooth; buried beneath soil; flesh dark red, variable, zones variable, little core; growth upright; leaves fairly numerous, medium to large, broad, some narrower, some crumpled, shining, dark green, tinged and much tinged purple. Mixed, some flat, some conical.

17. **EGYPTIAN TURNIP-ROOTED** (Sutton).—Root 2 inches deep, $3\frac{1}{2}$ to $4\frac{1}{2}$ inches diameter; skin deep red, fairly smooth; growth upright; leaves fairly numerous, of medium size, fairly broad, some crumpled, shining, dark green, more or less tinged purple.

(c) Roots Intermediate.

1. Foliage Green.

28. **INTERMEDIATE, VEITCH'S** (R. Veitch).—Root $7\frac{1}{2}$ inches deep, 2 to $3\frac{1}{2}$ inches diameter; skin dull deep red, fairly smooth; three-fourths root above soil; flesh dark red, zones distinct, little core; growth upright; leaves many, rather small, of medium width, slightly crumpled, shining, dark green, more or less tinged purple. A mixed stock with many misshapen roots.

29. **INTERMEDIATE, VEITCH'S** (Sutton), XXX September 28, 1917.—Root $6\frac{1}{2}$ inches deep, 2 to $3\frac{1}{2}$ inches diameter; skin dull deep red, fairly smooth; two-thirds root above soil; flesh dark, more brick-red than No. 28, zones distinct, little core; growth upright; leaves small to medium size and breadth, shining, dark green, tinged purple, some bronze.

39, 40. INTERMEDIATE, KING'S, Nos. 1 and 2 (E. W. King).—Root 7 inches deep, 3 to 4 inches diameter; skin dull dark red, smooth; half-root above soil; flesh dark red, zones distinct, some white, little core; growth upright; leaves many, of small to medium size and width, crumpled, shining, dark green, much tinged purple. Variable in leaf colour, some bronze, roots rather coarse and not of one shape.

73. NONPAREIL RED, YATES' (Barr). XXX September 28, 1917.—Root 6 to 10 inches deep, $3\frac{1}{2}$ to 4 inches diameter; oblong with abrupt tap root; flesh deep red, smooth, rough at top; half root above soil; flesh deep red, zones distinct, rather large core; growth upright; leaves medium to large, fairly broad, crumpled, shining, dark green, much tinged purple.

72. OBELISQUE RED, YATES' (Barr).—Root 8 to 10 inches deep, $3\frac{1}{2}$ to 4 inches diameter; oblong with abrupt tap root; skin deep red, smooth, rough; half root above soil; flesh deep red, zones distinct, variable, some showing white, rather large core; growth upright; leaves many, medium to large, fairly broad, shining, dark green, much tinged purple.

30. QUEEN MARY (Harrison).—Root 7 inches deep, $2\frac{1}{2}$ to $3\frac{1}{2}$ inches diameter; skin dull deep red, fairly smooth; three-fourths root above soil; flesh dark red, zones distinct, little core; growth upright; leaves many, of small to medium size and width, shining, dark green, tinged purple, some bronze.

2. Foliage Bronze.

25. CRIMSON MODEL PEAR-SHAPED (R. Veitch).—Root 5 to 6 inches deep, 3 to 4 inches diameter; tapering; skin dull deep red, smooth; one-fourth root above the soil; flesh dark red, zones distinct, some white, rather large core; growth upright; leaves many, large, broad, crumpled, shining, bronze, some greenish.

26, 27. DAINTY (Carter, Barr).—Root 7 inches deep, 3 to 4 inches diameter; tapering; skin dull deep red, smooth; one-fifth root above the soil; flesh buried; flesh dark red, zones indistinct, little core; growth upright; leaves many, fairly large, of medium width, crumpled, shining, bronze, some green. Stocks not true, and some more top than root. In No. 26 one, and 27 two, bolted.

23. QUEEN OF THE BLACKS (Barr). XX September 28, 1917.—Root 5 inches deep, 3 to 4 inches diameter; tapering; skin dull deep red, fairly smooth; one-third root above the soil; flesh variable, dark red, zones distinct, little core; growth upright; leaves many, large, broad, crumpled, shining, bronze.

22. STRASBURG DARK RED (Barr).—Root $6\frac{1}{2}$ inches deep, 3 to $3\frac{1}{2}$ inches diameter; tapering; skin dull deep red, fairly smooth, slightly russeted at top; half root above the soil; flesh very dark red, zones indistinct, little core; growth upright; leaves many, large, broad, crumpled, shining, bronze and some green. Irregular stock, some long.

(c) Roots Long.

(1) Foliage more or less Green.

67, 68, 69. BELL'S DEEP BLOOD-RED NON-BLEEDING (McLennan, R. Veitch Bell), XXX September 28, 1917.—Root 12 inches long, $2\frac{1}{2}$ to 3 inches diameter; tapering into rather abrupt tap root; skin dark dull red, fairly smooth; one-fifth root above soil; flesh very dark red, zones indistinct, little core; growth upright; leaves many, large, broad, little crumpled, shining, dark green, tinged more or less with purple. Raised and introduced by Messrs. Bell.

65. BLACK (Sutton), XXX September 28, 1917.—Root 9 inches long, $3\frac{1}{2}$ to 3 inches diameter; tapering, sometimes abruptly; skin dark dull red, fairly smooth; two-sevenths root above soil; flesh very dark red, zones indistinct, little core; growth upright; leaves many, large, broad, crumpled, shining, dark green, much tinged purple. True stock.

60. BLACK, GOLDIE'S (Barr).—Root 10 inches long, 3 to 4 inches diameter; tapering rather abruptly; skin dark dull red, fairly smooth, rough at top; one-fourth root above soil; flesh very dark red, zones distinct, variable, some green; growth upright; leaves many, large, broad, crumpled, some plain, shining, variable in colour, mainly dark green, much tinged purple. Good colour, but coarse in texture and side roots rather numerous.

63. BLACK, WHYRE'S (Barr).—Root 10 inches long, $3\frac{1}{2}$ to 4 inches diameter; tapering; skin dark dull red, smooth; one-eighth root above soil; flesh dark red, rather coarse. Zones indistinct, little core; growth rather spreading; leaves many, large, broad, shining, dark green, tinged more or less with purple. Mixed, some larger and more crumpled.

43, 44, 45. CHELTENHAM GREEN TOP (Harrison, Barr, Sydenham), No. 45, A.M. September 28, 1917.—Root 9 inches long, $2\frac{1}{2}$ to 4 inches diameter; tapering; skin dark red, smooth; one-seventh root above soil; flesh dark red, zones indistinct, little core; growth rather spreading; leaves fairly numerous, of medium size and width, plain, shining, green, slightly tinged purple. Nos. 43 and 44 were good, but with rather larger foliage and the zones were more distinct.

33. COVENT GARDEN COMPACT TOP.—See Dewar's Northumberland Red.

33. CRAPAUDINE (Barr).—Root 6 inches deep, 2 to $2\frac{1}{2}$ inches diameter; tapering; skin russeted red, rough; flesh very dark red, zones indistinct, little core; growth rather spreading; leaves many, of medium size and width, shining, green, slightly tinged purple. Many rough side roots, small top, distinct, splendid colour, but small.

62. DALL'S CRIMSON-LEAVED (Barr).—Root 9 to 13 inches long, 3 to 4 inches diameter; tapering into rather abrupt tap root; skin dark red, smooth; one-fourth root above soil; flesh dark red, zones indistinct but variable, little core; growth upright; leaves medium to large, medium to broad in width, some crumpled, shining, dark green, much tinged purple, some bronze.

33, 37, 38. DEWAR'S NORTHUMBERLAND RED (Nutting, Barr, Barr), A.M. September 28, 1917.—Root 10 inches deep, $2\frac{1}{2}$ to 3 inches diameter; tapering; skin dark red, smooth; one-fourth root above soil; flesh dark red, zones distinct, some white, little core; growth rather spreading; leaves many, of medium size and width, little crumpled, shining, dark green, much tinged purple, some bronze. No. 38 was sent in as 'Covent Garden Compact-top,' but the Committee considered it identical with Nos. 36 and 37.

54. DWARF RED, NUTTING'S (Barr).—Root 10 inches long, 3 to 4 inches diameter; tapering; skin dull dark red, rather rough, rather large core; one-fourth root above soil, some buried; flesh dark red, zones distinct white circles, core rather large; growth upright; leaves large, broad, crumpled, shining, dark green, much tinged purple, some bronze.

37. EXHIBITION, BRYDON'S (Barr), A.M. September 28, 1917.—Root 10 inches long, 3 inches diameter; tapering; skin very dark dull red, smooth; three-sevenths root above soil; flesh very dark red, zones indistinct, little core; growth upright; leaves many, medium to large, of medium width, little crumpled, shining, green, tinged more or less with purple.

42. FAVOURITE (Simpson).—Root 9 inches long, 3 to $3\frac{1}{2}$ inches diameter; tapering; skin dull dark red, rather rough; half root above soil; flesh very dark red, zones indistinct, little core; growth spreading; leaves many, small to medium, medium to broad in width, shining, green, tinged purple.

41. GREEN TOP (Sutton), F.C.C. September 28, 1917.—Root 8 inches long, $2\frac{1}{2}$ to 3 inches diameter; tapering; skin dull dark red, smooth; one-sixth root above soil; flesh very dark red, zones indistinct, little core; growth spreading; leaves many, of medium size and width, plain, shining, green, little tinged purple.

48. MARKET FAVOURITE (Sutton), XXX September 28, 1917.—Root 10 inches long, $2\frac{1}{2}$ to 3 inches diameter; tapering; skin dark red, smooth; one-eighth root above soil; flesh dark red, zones fairly distinct, little core; growth upright; leaves many, of medium size, fairly broad, nearly plane, shining, dark green, much tinged, purple, some almost bronze.

34. MASSY (Barr).—Root 9 inches deep, $2\frac{1}{2}$ to 3 inches diameter; tapering; skin dull dark red, smooth; one-seventh root above soil; flesh very dark red, zones indistinct, little core; growth upright; leaves of medium to large size and width, dark green, crumpled, and tinged purple.

64. MIDDLETON PARK FAVOURITE (Barr).—Root 9 inches long, 3 to $3\frac{1}{2}$ inches diameter; tapering; skin dark red, smooth; two-sevenths above soil; flesh dark red, zones distinctly variable, little core; growth upright; leaves many, large, broad, shining, dark green, much tinged purple and bronze. Mixed.

52. PRAGNELL'S EXHIBITION (Barr), XX September 28, 1917.—Root 6 inches long, 2 to $2\frac{1}{2}$ inches diameter; tapering; skin dark red, smooth; flesh dark red, zones distinct, with white circles, little core; root mostly buried; growth fairly upright; leaves many, small to medium, of medium width, slightly crumpled, shining, dark green, much tinged purple. Good stock.

60. PURPLE (Dobbie), XXX September 28, 1917.—Identical with No. 65 Black.

58. PURPLE TOP, CATTELL'S (Barr).—Root 10 inches long, 3 to $3\frac{1}{2}$ inches diameter; tapering; skin very dark dull red, smooth; one-fourth root above soil; flesh dark red, zones distinct, core rather large; growth upright, vigorous; leaves many, large, broad, crumpled, shining, green, much tinged purple, bronze and green. Mixed, irregular.

53. **SELECTED RED** (Nutting). A.M. September 28, 1917.—Root 6 inches long, 2 to 2½ inches diameter; tapering; skin dark red, smooth; root mostly buried; flesh dark red, close-grained, zones indistinct, little core; growth fairly upright; leaves many, small to medium, of medium width crumpled, slightly shining, dark green, much tinged purple.

56. **SUPERB RED** (R. Veitch).—Root 10 inches long, 2½ to 3 inches diameter, tapering; skin very dark dull red, fairly smooth; one-eighth root above soil, flesh very dark red, rather coarse, zones indistinct, little core; growth upright; leaves many, medium to large, fairly broad, crumpled, shining, dark green, much tinged purple.

2. Foliage Bronze.

59. **BLOOD RED** (Sutton).—Root 10 inches long, 1½ to 2 inches diameter; tapering; skin dark red, smooth; one-ninth root above soil; flesh dark red, zones distinct, little core; growth upright to spreading; leaves many, of medium size and width, slightly crumpled, shining, bronze.

35. **CRIMSON GEM** (Barr).—Root 9 inches long, 2½ to 3 inches diameter; tapering; skin dark red, smooth; one-seventh root above the soil; flesh dark red, zones fairly distinct, little core; growth upright; leaves many, medium size, and medium to broad in width, crumpled, shining, bronze.

61. **DELL'S BLACK-LEAVED** (Nutting).—Root 8 inches long, 1½ to 2 inches diameter; tapering; skin dark red, smooth, little russeted at top; one-third root above soil; flesh dark red, zones distinct, little core; growth upright; leaves many, of medium size and width, plain, shining, bronze.

55. **IMPROVED CRIMSON** (Notcutt).—Root 7 inches long, 1½ to 3 inches diameter; tapering; skin dark red, smooth; one-fifth root above soil, some buried; flesh dark red, zones indistinct, some distinct, little core; growth fairly upright; leaves many, small, rather narrow, plain, shining, bronze.

50. **NON PLUS ULTRA** (Barr).—Root 8 inches long, 3 to 3½ inches diameter; tapering; skin dull dark red, fairly smooth, mostly buried; flesh very dark red, zones variable, some distinct, some not, little core; growth upright; leaves many, large, broad, some crumpled, shining, bronze and green. Mixed and many side roots. One bolted.

31, 32. **PERFECTION** (Carter, Barr), No. 31, XX September 28, 1917.—Root 9 inches deep, 2 to 3½ inches diameter; tapering; skin dull deep red, fairly smooth, mostly buried; flesh very dark, zones indistinct, little core; growth upright, leaves many, of medium size and width, crumpled, shining, bronze. No. 32 was not as dark in colour, and had one-third root out of soil.

49. **PERFECTION** (Sutton), A.M. September 28, 1917.—Root 9 inches long, 2 to 2½ inches diameter; tapering; skin dark red, smooth; one-eighth root above soil; flesh very dark red, zones indistinct, little core; growth rather spreading; leaves rather few, small, rather narrow, slightly crumpled, shining, bronze.

46. **PINE APPLE** (Sutton).—Root 9 inches long, 2½ to 3 inches diameter; tapering; skin dark red, smooth; two-sevenths root above soil; flesh dark red, zones distinct, little core; growth rather spreading; leaves fairly numerous, small to medium, of medium width, crumpled, shining, bronze.

47. **PINE APPLE** (Barr).—Root 9 inches long, 2 to 3½ inches diameter; tapering; skin dull dark red, fairly smooth; one-fourth root above ground, some buried; flesh dark red, zones fairly distinct, little core; growth upright; leaves large, broad, crumpled, shining, bronze.

51. **ST. OSVYTH** (Barr).—Root 10 inches long, 2 to 3½ inches diameter; tapering; skin dark red, smooth; one-fourth root above soil, variable, some more; flesh dark red, zones distinct, little core; growth spreading; leaves many, small to medium, of medium width, some crumpled, shining, bronze and green, tinged purple. Mixed, some upright and more vigorous, some green.

24. **VICTORIA** (Barr).—Root 7 inches deep, 1½ inches diameter; tapering; skin dull deep red, fairly smooth; one-fifth root above the soil; flesh dark red, zones indistinct, little core; growth upright; leaves not very numerous, small, narrow, nearly plain, shining, bronze.

71. **WILLOW-LEAVED** (Dobbie).—Root 7 inches long, 2 inches diameter; tapering; skin dark red, smooth, little russeted at top; root mostly buried; flesh dark red, zones indistinct, little core; growth upright; leaves many, small, narrow, wavy, shining, bronze. A true stock of good colour for garden decoration.

SUMMER-SOWN BEET AT WISLEY, 1917-18.

EIGHTY-ONE stocks of beet were sown at Wisley on July 11, 1917, to determine the varieties most suitable for late sowing. They included all types of root, but only the turnip-shaped beets came to sufficient size to make this method of growing beets worth while. Many of these, however, were of a size suitable for use from Christmas onwards, the best being Nos. 1, 2, 3, 5, 6, 7, 8, 10, 11, 16, 17, 18, 21, 24, 31, 33, 78. It seems little known that, at least on well drained soils in the south of England, round beets sown by mid-July will reach a size suitable for cooking and may be left out unprotected through the whole winter, remaining useful until May. It is unsafe to leave the spring-sown beets on the ground, but so long as the summer-sown plants have not reached such a size that the crown begins to fork, they suffer little or no damage, even in severe weather.

VARIETIES.

| | |
|--------------------------------------|---|
| *1. Crimson Ball. | 37. Queen of the Blacks. |
| 2. Early Model Crimson Globe. | 38. } Intermediate No. 1. |
| 3. Crimson Globe (Kelway). | 39. } |
| 4. Crimson Globe (Webb). | 40. Intermediate No. 2. |
| 5. Crimson Globe, Sutton's (Kelway). | 41. New Intermediate. |
| 6. Crimson Globe (Cooper-Taber). | 42. Intermediate. |
| 7. Crimson Globe (Nutting). | 43. } |
| 8. Excelsior Turnip-rooted. | 44. } Cheltenham Green Top Selected. |
| 9. Reliance Globe. | 45. } |
| 10. Witham Fireball. | 46. Purple. |
| 11. Crosby's Egyptian Beet. | 47. } Perfection. |
| 12. The Crosby. | 48. } |
| 13. Egyptian Turnip-rooted. | 49. Whyte's Black. |
| 14. Egyptian Turnip-rooted Selected. | 50. Market Favourite. |
| 15. Egyptian Turnip-rooted. | 51. Pine Apple. |
| 16. Arlington Globe. | 52. Henderson's Pineapple. |
| 17. Defiance Dark Red Turnip-rooted. | 53. Dwarf Red. |
| 18. Defiance. | 54. Nutting's Dwarf Red. |
| 19. Prizetaker. | 55. } |
| 20. Model or Improved Globe. | 56. } Brydon's Exhibition. |
| 21. Detroit. | 57. } |
| 22. Early Model Globe. | 58. Dewar's Northumberland Red. |
| 23. Early Model Red Globe. | 59. Dewar's Northumberland Red Selected. |
| 24. Eclipse. | 60. } Pragnell's Exhibition re-selected. |
| 25. Early Red Globe. | 61. } |
| 26. Globe (Dobbie). | 62. Covent Garden Compact Top. |
| 27. Globe (Sutton). | 63. Crimson King. |
| 28. Middleton Park. | 64. Dainty. |
| 29. Dell's Black. | 65. St. Osyth. |
| 30. Superb Red. | 66. Black King. |
| 31. Pear-shaped. | 67. Elcombe's Victoria. |
| 32. Crimson (Nutting's). | 68. Purple. |
| 33. Purple. | 69. Goldie's Superb Black. |
| | 70. Dell's Crimson extra select. |
| | 71. Blood Red. |
| | 72. No. 100. Non-bleeding Deep Blood Red. |

* See p. 107.

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|-------------------------|-----------------------------|
| 73. Scarlet Perfection. | 78. Crimson Ball. |
| 74. Spinach Beet. | 79. Egyptian Turnip-rooted. |
| 75. Perpetual Spinach. | 80. Round. |
| 76. Seakale Beet. | 81. Bassano. |
| 77. Sugar Beet. | |

As the longer rooted types of beet proved unsuitable for this system of growing, no further mention of them is made in the following notes.

DESCRIPTIONS.

RED-FLESHED VARIETIES.

(a) *Roots round.*

(1) Foliage more or less Green.

78. Crimson Ball (Carter).—See p. 491. Stood well, but had three with green foliage.
22. Detroit Early Round (Cooper-Taber).—See p. 490. Mixed, green, tinged, and bronze foliage. Root very good deep colour.
24. Early Model Red Globe (R. Veitch).—See p. 490. Stood well, but mixed, green, tinged and bronze foliage.
25. Eclipse (Kelway).—Root 3 inches deep, 2 to 3 inches diameter; skin dark red, smooth; one-half root above soil; flesh dark red, zones variable, little core; growth upright to spreading; leaves many, large, wide, plain and crumpled, green, tinged and bronze.

(2) Foliage Bronze.

23. Early Model Globe (Sydenham).—See p. 490.
26. Early Red Globe (Barr).—See p. 490. The stock had two green-foliage plants.
27. Globe (Dobbie).—See p. 491.
28. Globe (Sutton).—See p. 491. The stock had one green-foliage plant.
80. Round (Carter).—Root $1\frac{1}{2}$ inches deep, 1 to $1\frac{1}{4}$ inches diameter; skin dull dark red, rather rough; buried beneath soil; flesh very dark red, zones indistinct, little core; growth upright; leaves fairly numerous, of narrow to medium width, crumpled, very dark bronze.

(b) *Roots flat-round.*

(1) Foliage more or less Green.

16. Arlington Globe (Cooper-Taber).—Root 2 inches deep, 2 to $2\frac{1}{2}$ inches diameter; skin dull dark red, smooth; one-third root above soil; flesh dark red, zones indistinct, little core; growth spreading; leaves many, large, wide, crumpled (some plain), much tinged and bronze. Stood well. Mixed, green, tinged, and bronze foliage.
81. Bassano (Carter).—See p. 491. Rather poor plant, roots with many side shoots.
1. Crimson Ball (Barr).—See p. 491. Stood well, but had four green-foliage plants.
3. Crimson Globe (Barr).—Root $2\frac{1}{2}$ inches deep, $2\frac{1}{2}$ to 3 inches diameter; skin dull dark red, smooth; one-third root above soil (some buried); flesh dark red, zones variable, little core; growth upright to spreading; leaves many, large, wide, crumpled, much tinged and bronze. Stood well, but eight green-foliage plants.
4. Crimson Globe (Webb).—Root $2\frac{1}{2}$ inches deep, $2\frac{1}{2}$ inches diameter; skin dull dark red, smooth; one-third root above soil (some buried); flesh dark red, zones indistinct, little core; leaves of medium to large size, fairly broad, crumpled, much tinged and bronze. Rather poor plant, and six plants with green foliage.
5. Crimson Globe (Kelway).—Stood well, but had five green-foliage plants.
21. Detroit (Kelway).—See p. 490. Stood well. Mixed, green, tinged, and bronze foliage.
2. Early Model Crimson Globe (Kelway), XXX February 19, 1918.—Root 2 inches deep, 2 to $2\frac{1}{2}$ inches diameter; skin dull dark red, smooth; one-third root above soil; flesh very dark red, zones indistinct, core little; growth

upright; leaves of medium to large size, fairly wide, crumpled, much tinged and bronze. Stood well, root rather poor in size but very good colour.

8. *Excelsior Turnip-rooted* (Barr).—Root 2 inches deep, 2 inches diameter; skin dull dark red, smooth; about one-third root above soil (some buried); flesh dark red, zones distinct, little core; growth upright to spreading; leaves many, large, broad, crumpled, much tinged, and bronze. Stood well, but with four greenish foliage plants.

9. *Prizetaker* (Dawkins).—Root 2½ inches deep, 2 inches diameter; skin dull dark red, smooth; about one-third root above soil (some buried); flesh dark red, zones mostly indistinct, little core; growth upright, leaves fairly numerous, of medium size, fairly broad, crumpled, tinged and bronze. Rather poor plant, some with greenish foliage.

9. *Reliance Globe* (Webb).—Root 2 inches deep, 2½ inches diameter; skin dull dark red, smooth; about one-third root above soil; flesh red, some with white rings, zones distinct, little core; growth rather spreading; leaves of medium size and width, crumpled, much tinged, and bronze. Rather poor plant, with eight green-foliage plants.

10. *Witham Fireball* (Cooper-Taber).—Root 3 inches deep, 2 to 2½ inches diameter; skin dull dark red, smooth; one-fourth root above soil; flesh dark red and deep brick-red, zones indistinct, but variable, little core; growth upright; leaves many, large, wide, crumpled, much tinged, and bronze. Stood well, but with four green-foliage plants.

(2) Foliage bronze.

6. *Crimson Globe* (Cooper-Taber).—Similar to No. 7.

7. *Crimson Globe* (Nutting).—See p. 490. Stood well, but had three green-foliage plants. A very good stock.

11. *Crosby's Egyptian* (Barr).—See p. 491. Stood well, but had six green and some greenish foliage plants.

17. *Defiance Dark Red Turnip-rooted* (Barr).—See p. 490. Stood well.

18. *Defiance* (Hurst).—Similar to No. 17. A very good stock.

13. *Egyptian Turnip-rooted* (Sutton).—See p. 491. Three plants with greenish foliage.

14. *Egyptian Turnip-rooted Selected* (Barr).—See p. 491. Three plants with greenish foliage.

15. *Egyptian Turnip-rooted* (Webb).—Like 14. Rather irregular and also variable in colour.

79. *Egyptian Turnip-rooted* (Carter).—Root 1½ inches deep, 2 inches diameter; skin dull dark red, fairly smooth; one-third root above soil; flesh dark red, some showing white, zones variable, little core; growth upright; leaves many, of medium size and width, slightly crumpled, bronze. Some green much tinged foliage plants.

20. *Model or Improved Globe* (Dawkins).—Root 1½ to 2 inches deep, 1½ inches diameter; skin dull dark red; smooth; root mostly beneath soil; flesh dark red, zones mostly indistinct, little core; growth upright; leaves rather few, of small to medium size and width, crumpled, bronze. Rather poor plant.

12. *The Crosby* (Cooper-Taber).—Like No. 11.

[NOTE.—Comparison of the arrangement here and on pp. 490 and 491 suggests that the amount of bronzing of foliage is to some extent dependent upon the season, and the shape of the root upon its maturity.]

MID-SEASON PEAS TRIED AT WISLEY, 1916.

ONE hundred and twenty-one stocks of Peas were grown for trial on ground that was trenched in the autumn of 1914, and dug and lightly manured in the autumn of 1915. The seeds were sown on March 31, 1916, at distances between the rows varying according to height, from 4 to 6 feet. Germination was generally excellent, and the growth first class. The Pea Weevil attacked the plants when just through the soil, but one spraying with lead arsenate checked that pest.

The rainfall was .98 April, 1.76 May, 1.55 June, .80 July.

The cultivation was under the charge of the Superintendent and the fruit and vegetable foreman, Mr. J. Wilson.

The trial was judged on July 17 for first mid-season, and on August 8 for the second mid-season varieties, and the following were selected as the best in their respective seasons.

FIRST MID-SEASON.

Award of Merit.

- 116. Clipper, sent by Messrs. Sydenham.
- 17. Danby Stratagem, sent by Messrs. Carter.
- 97. Duke of Albany, sent by Messrs. Sutton.
- 98. Duke of Albany, re-selected, sent by Messrs. Carter.
- 7. Evergreen Delicatesse, sent by Messrs. Carter.
- 86. Harvestman, sent by Messrs. Carter.
- 65. Improved Queen, sent by Messrs. Carter.
- 85. International, sent by Messrs. Carter.
- 51. Jersey Hero, sent by Messrs. Nutting.
- 54. Magnum Bonum, sent by Messrs. Barr.
- 87. Market Gardener, sent by Messrs. Carter.
- 109. Prince of Peas, sent by Messrs. Sutton.
- 112, 113. Quite Content, sent by Messrs. Barr and Messrs. Carter.
- 47. Royal Salute, sent by Messrs. Dickson.
- 106. Market King, sent by Messrs. Carter.
- 90. Standard, sent by Messrs. Barr.
- 9. The Newby, sent by Messrs. Hurst.

Highly Commended.

- 35. Best of All, sent by Messrs. Sydenham.
- 5. Buttercup, sent by Messrs. Carter.
- 2. Daisy, sent by Messrs. Simpson.
- 42. Gradus, sent by Messrs. Simpson.
- 94. Model Telephone, sent by Messrs. Carter.
- 64. Red Cross, sent by Mr. Sim.

- 15. Stratagem, sent by Messrs. Carter.
- 110. Centenary, sent by Messrs. Sutton.
- 11. Favourite, sent by Messrs. Sutton.
- 27. Peerless, sent by Messrs. Sutton.
- 88. Reliance Marrowfat, sent by Messrs. Webb.

Commended.

- 114. King George, sent by Messrs. Webb.

SECOND MID-SEASON.

Award of Merit.

- 66. Glory of Devon, sent by Messrs. Barr.
- 56. Continuity, sent by Messrs. Sutton.
- 55. Masterpiece, sent by Messrs. Sutton.
- 63. Matchless, sent by Messrs. Sutton.
- 52. Perpetual, sent by Messrs. Sutton.
- 41. Satisfaction, sent by Messrs. Sutton.

Highly Commended.

- 18. The Victor, sent by Messrs. Johnson.

Commended.

- 96. Alderman, sent by Messrs. Simpson.
- 12. Commonwealth, sent by Messrs. Carter.
- 40. Magnificent, sent by Messrs. Barr.
- 119. Ne Plus Ultra, sent by Messrs. Sydenham.
- 48. Paragon, sent by Messrs. Dickson & Robinson.
- 57. Best of All, sent by Messrs. Sutton.
- 21. Discovery, sent by Messrs. Sutton.
- 61. Incomparable, sent by Messrs. Sutton.
- 20. Prizewinner, sent by Messrs. Sutton.
- 111. Up-to-Date, sent by Messrs. Sutton.
- 108. The 'V.C.' sent by Messrs. Sutton.
- 83. William Richardson, sent by Messrs. Nutting.

Stocks under the same name as those recorded above have had awards in previous trials as follows :—

17. Danby Stratagem (A.M. 1901, Carter); 7. Evergreen Delicatessen (A.M. 1908, Carter); 86. Harvestman (A.M. 1908, Carter); 85. International (A.M. 1908, Carter); 54. Magnum Bonum (A.M. 1910, Barr); 109. Prince of Peas (A.M. 1910, Sutton); 112, 113. Quite Content (F.C.C. 1906, Beckett); 90. Standard (A.M. 1900, Sharpe); 2. Daisy (F.C.C. 1902, Wythes); 42. Gradus (F.C.C. 1900, Laxton); 15. Stratagem (F.C.C. 1882, Carter); 11. Favourite (A.M. 1913, Sutton); 27. Peerless (F.C.C. 1903, Barr); 66. Glory of Devon (A.M. 1899, R. Veitch); 56. Continuity (A.M. 1898, Sutton); 55. Masterpiece (A.M. 1913, Sutton); 41. Satisfaction (A.M. 1910, Sutton); 96. Alderman (F.C.C. 1900, Deal); 40. Magnificent (F.C.C. 1884, Eckford); 20. Prizewinner (F.C.C. 1901, Sutton).

The following varieties which had gained awards in earlier trials were grown but were not regarded as equal in merit to those in the foregoing list:—

Centenary (A.M. July 5, 1901 (Sutton)); Dawn (A.M. July 30, 1908 (Carter)); Dr. McLean (A.M. July 18, 1902 (Sutton)); Duke of York (A.M. June 6, 1893 (Cooper-Laber)); Edwin Beckett (F.C.C. July 3, 1900 (Beckett)); Eureka (A.M. July 18, 1911 (Sutton)); Exhibition (A.M. August 16, 1910 (Carter)); G. F. Wilson (F.C.C. 1872 (Carter)); King Edward (A.M. July 18, 1911 (Sutton)); Majestic (A.M. July 14, 1897 (Watkins & Simpson)); Moneymaker (A.M. August 2, 1910 (J. K. King)); Perfection (A.M. July 14, 1897 (R. Veitch)); Premier (A.M. July 18, 1911 (Bell)); Pride of the Market (F.C.C. July 22, 1881 (Carter)); Prior (A.M. July 22, 1898 (Eckford)); Prolific Marrowfat (A.M. July 18, 1902 (J. Veitch)); Queen (A.M. July 5, 1901 (Sharpe)); Saccharine (A.M. July 26, 1898 (Sim)); Scotsman (A.M. August 15, 1905 (Bell)); Senator (F.C.C. July 11, 1902 (A. Dean)); The Sherwood (A.M. July 5, 1901 (Hunt, Sutton)); Unique (F.C.C. 1872 (Laxton)); Warriston Wonder (A.M. July 11, 1913 (Bell)); Yorkshire Hero (A.M. August 16, 1910 (Sutton)).

VARIETIES.

- | | |
|-----------------------------------|---------------------------|
| *1. } Daisy. | 46. Delicatesse. |
| 2. } The Sherwood. | 47. Royal Salute. |
| 3. } Pride of the Market. | 48. Paragon. |
| 4. } Buttercup. | 49. Perfection. |
| 5. } Blue Beauty. | 50. Prolific Marrow. |
| 6. } Evergreen Delicatesse. | 51. Jersey Hero. |
| 7. } Warwickshire Pride. | 52. Perpetual. |
| 8. } The Newby. | 53. } Magnum Bonum. |
| 9. } Nonsuch. | 54. } Masterpiece. |
| 10. } Favourite. | 55. } Continuity. |
| 11. } Commonwealth. | 56. } Best of All. |
| 12. } Unique. | 57. } Superlative. |
| 13. } Abundance. | 58. } Incomparable. |
| 14. } Stratagem. | 59. } Supremacy. |
| 15. } Danby Stratagem. | 60. } Matchless. |
| 16. } The Victor. | 61. } Red Cross. |
| 17. } Majestic. | 62. } Improved Queen. |
| 18. } Prizewinner. | 63. } Discovery. |
| 19. } King Edward. | 64. } Glory of Devon. |
| 20. } Invincible. | 65. } Sensation. |
| 21. } Dr. McLean. | 66. } Queen Mary. |
| 22. } Peerless. | 67. } Seedling 230. |
| 23. } Senator. | 68. } Bell's Premier. |
| 24. } G. F. Wilson. | 69. } Edwin Beckett. |
| 25. } Plentiful. | 70. } Lancastrian. |
| 26. } Territorial. | 71. } Gladstone. |
| 27. } Veitch's Perfection. | 72. } Scotsman. |
| 28. } Eureka. | 73. } Seedling 231. |
| 29. } Prince of Wales. | 74. } Victorious. |
| 30. } Sharpe's Queen. | 75. } Constellation. |
| 31. } Magnificent. | 76. } Dawn. |
| 32. } Satisfaction. | 77. } Essex Wonder. |
| 33. } Gradus. | 78. } William Richardson. |
| 34. } Yorkshire Hero. | 79. } Exhibition. |
| 35. } Prizewinner. | 80. } International. |
| 36. } Hurst's Second Early Round. | 81. } Harvestman. |
| | 82. } Market Gardener. |
| | 83. } Reliance Marrowfat. |
| | 84. } Nonsuch Marrowfat. |
| | 85. } Sharpe's Standard. |

* See footnote, p. 107.

MID-SEASON PEAS TRIED AT WISLEY, 1916.

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- | | |
|-----------------------|--------------------------|
| 91. Union Jack. | 107. Multiple. |
| 92. Thousandfold. | 108. The 'V.C.' |
| 93. Saccharine. | 109. Prince of Peas. |
| 94. Model Telephone. | 110. Centenary. |
| 95. Alderman. | 111. Up-to-Date. |
| 96. Duke of Albany. | 112. } Quite Content. |
| 97. } Duke of Albany. | 113. } |
| 98. } Prior. | 114. King George. |
| 99. Battleship. | 115. Stourbridge Marrow. |
| 100. Duke of York. | 116. Chipper. |
| 101. General Joffre. | 117. Hercules. |
| 102. Telegraph. | 118. Warriston Wonder. |
| 103. Universal. | 119. Ne Plus Ultra. |
| 104. Profusion. | 120. Moneymaker. |
| 105. Market King. | 121. Goldfinder. |

DESCRIPTIONS AND NOTES.

NOTE.—In order to reduce the length of descriptions as far as possible the following particulars, which are not repeated in the description below, are given in the Table (p. 513), viz.: Seed colour and form, the date when crop was ready for picking, the number of days between germination and first flowering, full flowering and maturing of crop, the number of days to 'slatting,' that is between flowering and the appearance of the developing pod, and whether mildew-free or not. These particulars may be easily ascertained by reference to the Table under the number of the variety tried

A. FIRST MID-SEASON VARIETIES.

Above 1½ feet and under 3 feet.

Seed Round.

6. Blue Beauty (Hurst).—Height 2 feet 6 inches to 3 feet 6 inches; haulm sturdy, dark, branching above ground level; internodes short; pods mostly in pairs, straight, blunt, 3½ to 4 inches long, inflated, dark; peas large, 6 or 7 in pod, tightly packed, of fair flavour. Crop good. One rogue with marrow pods.

5. Puttercup (Carter). XXX July 17, 1916.—Height 2 feet 6 inches to 3 feet 6 inches; haulm sturdy, dark, branching above ground level; internodes short; pods mostly in pairs, curved, pointed, 3½ to 4 inches long, inflated, pale; peas of medium size, 6 to 8 in pod, tightly packed, of fair flavour. Crop good.

4. Pride of the Market (Carter).—Height 2 feet 6 inches to 3 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods mostly in pairs, slightly curved, pointed, kinked at stalk, 4 to 4½ inches long, inflated, dark; peas of medium size, 6 to 8 in pod, tightly packed, of fair flavour. Crop medium.

45. Second Early Round (Hurst).—Height 2 feet to 3 feet; haulm rather slender, rather light, branching at ground level; internodes long; pods in pairs, curved, pointed, 3½ to 4 inches long, inflated, pale; peas of medium size, 5 or 6 in pod, tightly packed, of fair flavour. Crop good.

Seed Wrinkled.

1. Daisy (Carter).—Height 2 feet to 3 feet; haulm sturdy, dark, branching at ground level, internodes short, pods mostly in pairs,

slightly curved, pointed, $3\frac{1}{2}$ to 4 inches long, inflated, pale; peas large, 6 to 8 in pod, tightly packed, of fair flavour. Crop good.

2. Daisy (Simpson), **XXX** July 17, 1916.—Height 2 feet to 2 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods mostly single, slightly curved, pointed, $3\frac{1}{2}$ to 4 inches long, inflated, pale; peas large, 6 to 8 in pod, tightly packed, and of fair flavour. Crop good. Differed from No. 1 in having less flat rounder pods.

11. Favourite (Sutton), **XXX** July 17, 1916.—Height 2 feet 6 inches to 3 feet 6 inches; haulm sturdy, dark, branching above ground level; internodes short; pods mostly single, straight, blunt, $3\frac{1}{2}$ to 4 inches long, inflated, pale; peas large, 7 or 8 in pod, tightly packed, of good flavour. Crop good.

3. The Sherwood (Simpson).—Height 2 feet to 3 feet; haulm sturdy, dark, branching above ground level; internodes short; pods mostly single, straight, blunt, 3 to $3\frac{1}{2}$ inches long, inflated, dark; peas of medium size, 6 to 8 in pod, tightly packed, of fair flavour. Crop medium.

8. Warwickshire Pride (Simpson).—Height $2\frac{1}{2}$ feet to $3\frac{1}{2}$ feet; haulm sturdy, dark, branching above ground level; internodes long; pods mostly single, curved, pointed, 4 to $4\frac{1}{2}$ inches long, inflated, light; peas large, 7 or 8 in pod, tightly packed, of fair flavour. Crop medium. One rogue with narrow pods.

43. Yorkshire Hero (Sutton).—Height $2\frac{1}{2}$ feet to $3\frac{1}{2}$ feet; haulm sturdy, dark, branching at ground level; internodes short; pods mostly in pairs, straight, blunt, 3 to $3\frac{1}{2}$ inches long, inflated, pale; peas large, 6 or 7 in pod, tightly packed, of good flavour. Crop good.

B. Above 3 feet and under $4\frac{1}{2}$ feet.

Seed wrinkled.

14. Abundance (Sutton).—Height 3 feet to 4 feet; haulm sturdy, dark, branching above ground level; internodes short; pods mostly single, straight, blunt, $3\frac{1}{2}$ to 4 inches long, inflated, light; peas large, 6 in pod, tightly packed, of fair flavour. Crop good.

12. Commonwealth (Carter), **XX** August 8, 1916.—Height 3 feet to $4\frac{1}{2}$ feet; haulm sturdy, dark, branching at and above ground level; internodes short; pods single or in pairs, straight, some slightly curved, pointed, $4\frac{1}{2}$ inches long, inflated, dark; peas large, 7 or 8 in pod, tightly packed, of good flavour. Crop good.

21, 22. Discovery (Sutton, Dickson), No. 21, **XX** August 8, 1916.—Height 3 feet to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes long; pods single or in pairs, straight, pointed, $4\frac{1}{2}$ to $5\frac{1}{2}$ inches long, inflated, pale and dark; peas large, 7 or 8 in pod, rather loosely packed, of good flavour. Crop medium. No. 21 had some narrow-leaved rogues with curved pods. No. 22 germinated poorly.

25. Dr. McLean, Improved Strain (Sutton).—Height 3 feet 6 inches to 4 feet 6 inches; haulm sturdy, dark, branching at ground level

internodes short; pods single or in pairs, straight or curved, blunt, to $4\frac{1}{2}$ inches long, inflated, pale; kink in many pods; peas large, or 7 in pod, loosely packed, of fair flavour. Crop good.

7. Evergreen Delicatesse (Carter), A.M. July 17, 1916.—Height 2 feet 6 inches to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods mostly in pairs, sickle or straight, pointed, narrow and kinked near stalk, $3\frac{1}{2}$ to 4 inches long, dark; peas large, 7 or 8 in pod, tightly packed, of fair flavour. Crop good; shade distinct.

23. King Edward (Sutton).—Height 2 feet 6 inches to 4 feet; haulm sturdy, dark, branching at ground level; internodes long; pods mostly in pairs, straight, blunt, 4 to $4\frac{1}{2}$ inches long, inflated, dark; peas large, 6 to 8 in pod, tightly packed, of fair flavour. Crop medium; patchy.

53, 54. Magnum Bonum (Sutton, Barr). No. 54 A.M. July 17, 1916.—Height 2 feet 6 inches to 5 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short and long; pods borne mostly in pairs, straight, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 9 in pod, tightly packed, of excellent flavour. Crop good. No. 53 stock not typical.

19. Majestic (Watson & Simpson).—Height 3 feet to 4 feet; haulm sturdy, dark, branching above ground level; internodes short; pods mostly single, straight, pointed, 4 to $4\frac{1}{2}$ inches long, inflated, dark; peas large, 7 or 8 in pod, tightly packed, of fair flavour. Crop medium.

26, 27. Peerless (Barr, Sutton), No. 27, XXX July 17, 1916.—Height 3 feet to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods borne singly and in pairs, curved, pointed, 4 to 5 inches long, inflated, dark; peas large, 8 to 10 in pod, tightly packed, of good flavour. Crop good. No. 26 a poor stock, pods paler and some blunt-podded rogues.

32, 33. Perfection (Carter, R. Veitch).—Height 3 feet 6 inches to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods borne mostly in pairs, straight, blunt, $3\frac{1}{2}$ to 4 inches long, inflated, dark; peas large, 7 or 8 in pod, tightly packed, of fair flavour. Crop fair. No. 32, some with slightly curved pods, one rogue with narrow leaves; No. 33 stouter and bigger leaved, pods yellow, germination bad.

35, 37. Prince of Wales (Barr, Simpson).—Height 3 feet 6 inches to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods in pairs, curved, blunt, $3\frac{1}{2}$ to 4 inches long, inflated; peas of medium size, 7 or 8 in pod, loosely packed, of fair flavour. Crop good.

38, 39. Queen (Simpson, Barr).—Height $2\frac{1}{2}$ feet to 3 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods mostly in pairs, curved, pointed, 4 to $4\frac{1}{2}$ inches long, inflated, dark; peas large, 7 or 8 in pod, tightly packed, of good flavour. Crop fair. True stock. No. 38 is not true, being taller, with longer internodes and light pods.

28. Senator (Webb).—Height 3 feet 6 inches to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes long; pods mostly in pairs, curved, pointed, $3\frac{1}{2}$ to 4 inches long, pale, kinked near stalk; peas large, 8 or 9 in pod, tightly packed, and of little flavour. Crop good.

15, 16. Stratagem (Carter, Barr), No. 15 XXX July 17, 1916.—Height $3\frac{1}{2}$ feet to 4 feet 6 inches; haulm sturdy, dark, branching above ground level; internodes long; pods single or in pairs, straight, pointed, 4 to $4\frac{1}{2}$ inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of fair flavour. No. 15 crop good. This is 'Standard Stratagem.' No. 16 a bad stock, with rogues with blunt pods; poor crop.

31. Territorial (Hurst).—Height 3 feet to 4 feet; haulm rather slender, dark, branching at ground level; internodes long; pods mostly single, straight back, curved, point blunt, $3\frac{1}{2}$ to 4 inches long, inflated, dark; peas large, 7 or 8 in pod, loosely packed, of good flavour. Crop fair. Good stock.

9. The Newby (Hurst), A.M. July 17, 1916.—Height 4 feet 6 inches to 5 feet; haulm sturdy, dark, branching at and above ground level; internodes long; pods single or in pairs, back straight, sharply curved at point, pointed, 4 to $4\frac{1}{2}$ inches long, dark; peas of medium size, 8 or 9 in pod, tightly packed, of very good flavour. Crop good.

13. Unique (Sydenham).—Height 4 feet to 5 feet; haulm sturdy, dark, branching at ground level; internodes long; pods single or in pairs, curved, pointed, kinked near stalk, $3\frac{1}{2}$ to 4 inches long, pale; peas of medium size, 6 or 7 in pod, tightly packed, of good flavour. Crop good.

C. Above $4\frac{1}{2}$ feet and under 6 feet.

Seed round.

78. Victorious (Hurst).—Height 5 feet to $5\frac{1}{2}$ feet; haulm delicate, light, branching above ground level; internodes long; pods mostly single, straight, blunt, 3 to $3\frac{1}{2}$ inches long, inflated, dark; peas large, 4 to 6 in pod, tightly packed, of poor flavour. Crop medium. Poor stock with many short curved pods.

Seed wrinkled.

17. Danby Stratagem (Carter), A.M. July 17, 1916.—Height 4 feet to 5 feet; haulm sturdy, dark, branching at ground level; internodes long; pods mostly in pairs, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 8 in pod, tightly packed, of very good flavour. Crop good. Not 'Stratagem' type.

80. Dawn (Carter).—Height 4 feet 6 inches to 6 feet; haulm delicate, light, branching above ground level; internodes long; pods mostly single, straight, blunt, 3 to 4 inches long, inflated, pale; peas large, 6 to 8 in pod, tightly packed, of good flavour. Crop medium.

73. Edwin Beckett (Beckett).—Height $4\frac{1}{2}$ feet to 6 feet; haulm

delicate, light, branching above ground level; internodes long; pods mostly single, curved, pointed, $3\frac{1}{2}$ to 4 inches long, inflated, dark; peas large, 7 to 9 in pod, tightly packed, of good flavour; seed grey-green. Crop good.

42. Gradus (Simpson).—Height 5 feet to 6 feet; haulm rather tender, light, branching at ground level; internodes long; pods mostly single, curved, pointed, 4 to $4\frac{1}{2}$ inches long, inflated, dark; peas of medium size, 7 or 8 in pod, tightly packed, of full flavour. Crop good.

65. Improved Queen (Carter), **A.M.** July 17, 1916.—Height 4 feet inches to 5 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes long; pods mostly in pairs, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good.

51. Jersey Hero (Nutting), **A.M.** July 17, 1916.—Height 5 feet to 6 feet; haulm sturdy, light, branching at ground level; internodes short; pods mostly in pairs, slightly curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, pale; peas of medium size, 9 or 10 in pod, tightly packed, of good flavour; a few yellow seeds. Good crop.

30. Plentiful (Hurst).—Height 4 feet to 5 feet; haulm sturdy, dark, branching at ground level; internodes long; pods mostly in pairs, curved, pointed, 4 to $4\frac{1}{2}$ inches long, inflated, dark; peas of medium size, 9 or 10 in pod, loosely packed, of good flavour. Crop good, but not as good as 'Senator,' one of the parents.

64. Red Cross (Sim), **XXX** July 17, 1916.—Height 6 feet to 7 feet; haulm delicate, light, branching above ground level; internodes long; pods mostly in pairs, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 7 or 8 in pod, tightly packed, of fair flavour. Crop good, but of two types, requires further selection. Some dwarf rogues.

47. Royal Salute (Dickson), **A.M.** July 17, 1916.—Height 4 feet inches to 5 feet 6 inches; haulm sturdy, dark; internodes long, branching at ground level; pods mostly in pairs, straight, pointed, 4 to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good.

71. Seedling 230 (Carter).—Height 5 feet 6 inches to 6 feet 6 inches; haulm delicate, light, branching above ground level; internodes long; pods mostly single, curved, blunt, $3\frac{1}{2}$ to 4 inches long, inflated, dark; peas of medium size, fairly tightly packed, of fair flavour. Crop good, but all at top of haulm.

D. Over 6 feet.

Seed round.

79. Constellation (Hurst).—Height 6 feet to 7 feet; haulm delicate, light, branching above ground level; internodes long; pods mostly single, curved, pointed, $3\frac{1}{2}$ to 4 inches long, inflated, dark; peas of medium size, 7 or 8 in pod, rather loosely packed, of fair flavour. Good crop.

106. Market King (Carter), **A.M.** July 17, 1916.—Height 6 feet to

7 feet; haulm delicate to medium strength, light, branching above ground level; internodes long; pods mostly single, curved, pointed, $3\frac{1}{2}$ to 4 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of fair flavour. Crop good, prolific.

107. Multiple (Hurst).—Height 6 feet to 7 feet; haulm delicate, light, branching above ground level; internodes long; pods mostly in pairs, but some in threes, curved, pointed, $3\frac{1}{2}$ to 4 inches long, inflated, pale; peas of medium size, 7 or 8 in pod, tightly packed, of fair flavour. Crop good.

105. Profusion (Hurst).—Height 7 feet to 8 feet; haulm delicate, light, branching above ground level; internodes long; pods in pairs and in threes, curved, pointed, $3\frac{1}{2}$ inches long, pale; peas of medium size, 7 or 8 in pod, tightly packed, of very good flavour. Big crop, but not quite true.

Seed wrinkled.

95, 96. Alderman (Barr, Simpson), No. 96, XX August 8, 1916.—Height 6 feet to 8 feet; haulm delicate to medium, dark, branching above ground level; internodes long; pods mostly single, curved, pointed, 4 to $4\frac{1}{2}$ inches long, inflated, dark; peas large, 8 to 10 in pod, tightly packed, of good flavour. Crop good. In No. 96 the pods were only slightly curved, seed green and yellow, and germination poor, consequently later. See also 'Clipper.'

100. Battleship (Carter).—Height 6 feet to 7 feet 6 inches; haulm delicate to medium, light, branching above ground level; internodes long; pods single or in pairs, straight, blunt, $3\frac{1}{2}$ to 4 inches long, inflated, dark; peas large, 7 to 9 in pod, tightly packed, and of good flavour. Crop good. Mixed stock, some with curved, pointed pods.

116. Clipper (Sydenham), A.M. July 17, 1916.*—Height 6 feet to 7 feet; haulm delicate to medium, light, branching above ground level; internodes long; pods mostly single, slightly curved at point, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of very good flavour. Crop good. Of 'Alderman' type straight, inturned point to pod.

97, 98. Duke of Albany Selected (Sutton, Carter), A.M. July 17, 1916.—Height 6 feet to 7 feet 6 inches; haulm of medium strength, light, branching above ground level; internodes long; pods mostly single, curved, pointed, $4\frac{1}{2}$ to $5\frac{1}{2}$ inches long, inflated, dark; peas large, 8 to 10 in pod, tightly packed, and of good flavour. Crop good. No. 98 sent in as 'Duke of Albany Re-selected,' had very full pods, and came in six days earlier than 97.

101. Duke of York (Cooper-Taber).—Height 6 feet to 7 feet 6 inches; haulm delicate to medium, light, branching above ground level; internodes long; pods mostly single, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, pale; peas large, 9 or 10 in pod, tightly packed, and of good flavour. Crop good.

* Raised to F.C.C. in 1917.

81. Essex Wonder (Nutting).—Height 7 feet to 8 feet; haulm of medium strength, light, branching above ground level; internodes long; pods single or in pairs, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 9 or 10 in pod, tightly packed, of good flavour. Crop medium. Germination poor.

84. Exhibition (Carter).—Height 6 feet to 7 feet; haulm delicate, light, branching above ground level; internodes long; pods single, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, pale; peas medium to large, 8 or 9 in pod, loosely packed, of good flavour. Crop good.

86. Harvestman (Carter), A.M. July 17, 1916.—Height 6 feet to 7 feet; haulm delicate, dark, branching above ground level; internodes long; pods single, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 10 or 11 in pod, tightly packed, of good flavour.

85. International (Carter), A.M. July 17, 1916.—Height 6 feet to 7 feet; haulm delicate, light, branching above ground level; internodes long; pods single, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 9 or 10 in pod, tightly packed, of good flavour. Crop good.

114. King George (Webb), XX July 17, 1916.—Height 6 feet to 6 feet 6 inches; haulm delicate to medium, light, branching above ground level; internodes long; pods mostly single, curved, pointed, $\frac{1}{2}$ to 6 inches long, inflated, pale; peas large, 9 to 11 in pod, tightly packed, of good flavour. Crop good.

87. Market Gardener (Carter), A.M. July 17, 1916.—Height 6 feet to 7 feet; haulm delicate, dark, branching above ground level; internodes long; pods mostly single, curved, pointed, $3\frac{3}{4}$ to 4 inches long, inflated, dark; peas large, 7 to 9 in pod, tightly packed, of good flavour. Crop good.

94. Model Telephone (Carter), XXX July 17, 1916.—Height 6 feet to 7 feet; haulm delicate to medium, light, branching above ground level; internodes long; pods mostly single, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, pale; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good.

72. Premier (Bell).—Height 6 feet to 7 feet; haulm of medium strength, light, branching above ground level; internodes long; pods mostly single, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 9 or 10 in pod, of good flavour. Crop and germination poor. Some with blunt pods.

109. Prince of Peas (Sutton), A.M. July 17, 1916.—Height 6 feet to 7 feet; haulm delicate to medium, dark, branching above ground level; internodes long; pods single and in pairs, straight, blunt, 4 to 5 inches long, inflated, pale; peas large, 8 or 9 in pod, tightly packed, of very good flavour. Crop good.

70. Queen Mary (Sim).—Height 6 feet 6 inches to 7 feet 6 inches; haulm delicate, light, branching above ground level; internodes long; pods mostly single, straight, blunt, $3\frac{1}{2}$ to 4 inches long, inflated, pale; peas large, 7 or 8 in pod, loosely packed, of poor flavour. Crop medium. Pods all at the top of haulm.

112, 113. Quite Content (Barr, Carter), A.M. July 17, 1916.—Height 6 feet to 7 feet 6 inches; haulm delicate to strong, dark and light, branching above ground level; internodes long; pods single or in pairs, curved, pointed, $4\frac{1}{2}$ to 6 inches long, dark and pale; peas large, 8 to 11 in pod, tightly packed, of very good flavour. No. 112 was darker in haulm and pods than 113.

88. Reliance Marrowfat (Webb), XXX July 17, 1916.—Height 7 ft. to 8 feet; haulm delicate, dark, branching above ground level; internodes long; pods mostly single, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, of good flavour. Crop good. Of 'Alderman' type.

93. Saccharine (Sim).—Height 7 feet to 8 feet 6 inches; haulm delicate to medium, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 4 to $4\frac{1}{2}$ inches long, inflated, pale; peas large, 8 or 9 in pod, of fair flavour. Crop good.

77. Seedling 231 (Carter).—Height 7 feet to 8 feet; haulm of medium strength, light, branching above ground level; internodes long; pods mostly single, straight, blunt, $3\frac{1}{2}$ to 4 inches long, dark; peas of medium to large size, of fair flavour. Crop good. Seed not yet true.

90. Standard (Barr), A.M. July 17, 1916.—Height 7 feet to 8 ft. haulm delicate to medium, dark, branching above ground level; internodes long; pods mostly single, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good. Of 'Alderman' type.

115. Stourbridge Marrow (Webb).—Height 6 feet to 7 ft. haulm of medium strength, light, branching above ground level; internodes long; pods mostly single, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good.

SECOND MID-SEASON VARIETIES.

A. Above 3 feet and under $4\frac{1}{2}$ feet.

Seeds wrinkled.

46. Delicatesse (Carter).—Height 3 feet to $4\frac{1}{2}$ feet; haulm dark, branching at ground level; internodes long; pods mostly in pairs, curved, pointed, $3\frac{1}{2}$ to 4 inches long, pale; peas of medium size, 8 or 9 in pod, tightly packed, of very good flavour. Crop good.

66, 67, 68. Glory of Devon (Barr, R. Veitch, Simpson), A.M. August 8, 1916.—Height 5 feet to 6 feet; haulm strong, branching at ground level; internodes long; pods single or in pairs, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good. Distinct. No. 67 not so distinct, more curved and sharper pods than some pale podded forms. No. 68 dwarfer stock, germination not so good.

24. **Invincible Marrowfat** (Sutton).—Height 3 feet 6 inches to 4 feet 6 inches; haulm sturdy, dark, branching from ground level; internodes short; pods mostly single, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, pale; peas of medium size, 8 or 9 in pod, tightly packed, of fair flavour. Crop good.

74. **Lancastrian** (Dickson & Robinson).—Height 3 feet 6 inches to 4 feet 6 inches; haulm of medium strength, dark, branching at ground level; internodes of medium length; pods mostly in pairs, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop patchy. Some narrow-eaved rogues with smaller pods.

40. **Magnificent** (Barr), **XX** August 8, 1916.—Height 3 feet to 4 feet; haulm sturdy, dark, branching at ground level; internodes short; pods single or in pairs, straight, blunt, $3\frac{1}{2}$ to 4 inches long, inflated, dark; peas large, 6 or 7 in pod, tightly packed, of fair flavour. Crop good. One rogue with curved and pointed pods.

44. **Prizewinner** (Sydenham).—Height 3 feet to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods single or in pairs, curved, pointed, 4 to $4\frac{1}{2}$ inches long, inflated, dark; peas of medium size, 7 or 8 in pod, tightly packed, of fair flavour. Crop medium. Some with straight blunt pods.

10. **Nonsuch** (Sutton).—Height 2 feet 6 inches to 3 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods mostly single, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, light; peas large, 7 or 8 in pod, tightly packed, of good flavour. Crop poor, maturation bad. Thin plant, but vigorous.

48. **Paragon** (Dickson & Robinson), **XX** August 8, 1916.—Height 3 feet 6 inches to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods single or in pairs, curved, pointed, 4 to 5 inches long, inflated, pale; peas of medium size, 8 or 9 in pod, tightly packed, of good flavour. Crop good. Some with blunt pods.

20. **Prizewinner** (Sutton), **XX** August 8, 1916.—Height 3 feet to 4 feet; haulm sturdy, dark, branching at ground level; internodes short; pods single or in pairs, straight, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 7 or 8 in pod, tightly packed, of fair flavour. Crop medium. One rogue with blunt pods.

1. **Satisfaction** (Sutton), **A.M.** August 8, 1916.—Height 3 feet to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods single or in pairs, straight, blunt, 4 to 5 inches long, inflated, pale; peas large, 6 or 7 in pod, tightly packed, of fair flavour. Crop good.

1. **Scotsman** (Bell).—Height 2 feet 6 inches to 4 feet; haulm sturdy, dark, branching at ground level; internodes sturdy; pods in pairs, curved, pointed, 4 to $4\frac{1}{2}$ inches long, inflated, dark; peas of medium size, 7 to 9 in pod, fairly tightly packed, of fair flavour; green. Crop medium. Mixed stock.

1. **Superlative** (Dickson, Sutton).—Height $3\frac{1}{2}$ feet to $4\frac{1}{2}$ feet; haulm sturdy, dark, branching from ground level; internodes short; crop good.

Pods borne mostly in pairs, slightly curved, some blunt, others pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 8 to 10 in pod, loosely packed, of good flavour. Crop good.

69. Sensation (Sarsons).—Height 3 feet 6 inches to 4 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes short; pods mostly in pairs, straight, blunt, $3\frac{1}{2}$ to 4 inches long, inflated, pale; peas large, 6 to 8 in pod, loosely packed, of good flavour. Crop good, but all at top of haulm. Germination bad.

82, 83. William Richardson (Barr, Nutting), No. 83, XX August 8, 1916.—Height 3 feet 6 inches to 4 feet; haulm sturdy, dark, branching at ground level; internodes sturdy; pods single or in pairs, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 7 to 10 in pod, tightly packed, of good flavour. Crop good. No. 82 had some with straight pods.

B. Above $4\frac{1}{2}$ feet and under 6 feet.

Seeds wrinkled.

57, 58. Best of All (Sutton, Barr), No. 57, XX August 8, 1916.—Height 3 feet to 5 feet; haulm sturdy, dark, branching at ground level; internodes short; pods single or in pairs, straight, pointed, 4 to $4\frac{1}{2}$ inches long, inflated, dark; peas of medium to large size, 7 or 8 in pod, tightly packed, of good flavour. In No. 58 the seeds were green and yellow, rather loosely packed, and three rogues.

56. Continuity (Sutton), A.M. August 8, 1916.—Height 4 feet to 5 feet; haulm sturdy, dark, branching at ground level; internodes short; pods single or in pairs, straight, blunt, $3\frac{1}{2}$ to 4 inches long, inflated, dark; peas of medium size, 6 or 7 in pod, tightly packed, of good flavour. Crop good.

34. Eureka (Sutton).—Height 4 feet to 5 feet; haulm sturdy, light, branching at ground level; internodes short; pods mostly in pairs, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, pale or dark; peas large, 8 or 9 in pod, tightly packed, of fair flavour. Crop fair, but uneven.

35. Eureka (Sydenham), XXX July 7, 1916.—This is 'Best of All,' q.v., the dark podded selection of 'Eureka.'

29. G. F. Wilson (Carter).—Height 4 feet to 5 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes long; pods single or in pairs, curved, blunt, 4 to $4\frac{1}{2}$ inches long, inflated, dark; peas of medium size, 7 or 8 in pod, tightly packed. Crop good. One tall rogue, smaller pods. An old variety, now superseded.

61. Incomparable (Sutton), XX August 8, 1916.—Height 4 feet to 5 feet; haulm sturdy, dark, branching at ground level; internodes short; pods single or in pairs, straight, blunt, 4 to $4\frac{1}{2}$ inches long, inflated, dark; peas large, 7 or 8 in pod, tightly packed, of good flavour. Crop good. Some plants with pointed pods.

55. Masterpiece (Sutton), A.M. August 8, 1916.—Height 4 feet 6 inches to 5 feet 6 inches; haulm sturdy, dark, branching at ground level; internodes long; pods mostly in pairs, curved, pointed, $4\frac{1}{2}$ to 5

inches long, inflated, dark ; peas large, 7 to 9 in pod, loosely packed, of good flavour. Crop good. True.

63. Matchless (Sutton), A.M. August 8, 1916.—Height 5 feet to 6 feet ; haulm sturdy, dark, branching at ground level ; internodes long ; pods mostly in pairs, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark ; peas large, 7 or 8 in pod, loosely packed, of good flavour. Crop good.

89. Nonsuch Marrowfat (Webb).—Height 5 feet to 5 feet 6 inches ; haulm sturdy, dark, branching above ground level ; internodes short to medium ; pods mostly in pairs, slightly curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark ; peas large, 9 or 10 in pod, tightly packed, of good flavour. Crop good. Somewhat similar to 'Best of All.'

52. Perpetual (Sutton), A.M. August 8, 1916.—Height 4 feet 6 inches to 6 feet ; haulm sturdy, dark, branching at ground level ; internodes short ; pods mostly single, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark ; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good.

50. Prolific Marrow (Sutton).—Height 4 feet to 5 feet ; haulm rather delicate, light, branching above ground level ; internodes long ; pods single or in pairs, straight, blunt, 4 to $4\frac{1}{2}$ inches long, inflated, dark ; peas large, 7 or 8 in pod, tightly packed, of good flavour. Crop medium.

62. Supremacy (Hurst).—Height 5 to 6 feet ; haulm sturdy, dark, branching at ground level ; internodes variable ; pods mostly in pairs, curved, pointed, 4 to $4\frac{1}{2}$ inches long, inflated, dark ; peas of medium size, 7 to 8 in pod, tightly packed, of good flavour. Crop good.

18. The Victor (Johnson), XXX August 8, 1916.—Height 4 feet to 5 feet ; haulm sturdy, dark, branching at ground level ; internodes long ; pods single or in pairs, curved, pointed, 5 to $5\frac{1}{2}$ inches long, inflated, pale or dark ; peas large, 8 or 9 in pod, loosely packed, of fair flavour ; seed grey-green. Crop good. A few narrow-leaved rogues, pods pale and dark.

91. Union Jack (Hurst).—Height 5 feet 6 inches to 6 feet ; haulm delicate to medium, dark, branching above ground level ; internodes short to medium ; pods mostly single, curved, pointed, 4 to $4\frac{1}{2}$ inches long, inflated, dark ; peas large, 7 to 8 in pod, tightly packed, of very good flavour. Crop good.

C. Over 6 feet.

Seed round.

103. Telegraph (Carter).—Height 6 feet to 7 feet 6 inches ; haulm delicate to medium, light, branching above ground level ; internodes long ; pods mostly single, curved, pointed, $3\frac{1}{2}$ to 4 inches long, inflated, pale ; peas large, 7 or 8 in pod, tightly packed, of good flavour. Crop good.

104. Universal (Hurst).—Height 7 feet to 8 feet ; haulm delicate, light, branching above ground level ; internodes long ; pods mostly in pairs, curved, pointed, $3\frac{1}{2}$ to 4 inches long, pale ; peas of medium size, 7 or 8 in pod, tightly packed, of fair flavour. Crop good.

Seed wrinkled.

110. Centenary (Sutton), XXX August 8, 1916.—Height 6 feet to 7 feet 6 inches; haulm delicate to medium, light, branching above ground level; internodes long; pods mostly single, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good.

102. General Joffre (Hurst).—Height 6 feet to 7 feet 6 inches; haulm delicate, light, branching above ground level; internodes long; pods mostly single, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop good. Germination poor.

75. Gladstone (Sydenham).—Height 6 feet to 7 feet; haulm medium to sturdy, light, branching above ground level; internodes long; pods single or in pairs, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of good flavour. Crop medium. This was not 'Gladstone,' but 'Duke of Albany.' Some plants with blunt pods.

121. Goldfinder (R. Veitch).—Height 6 feet to 7 feet; haulm medium to sturdy, light, branching above ground level; internodes short; pods single or in pairs, curved, blunt, 3 to $3\frac{1}{2}$ inches long, inflated, pale; peas large, 6 or 7 in pod, tightly packed, of good flavour. Crop medium. Of 'Ne Plus Ultra' type, and very similar to it.

117. Hercules (Dickson & Robinson).—Height 6 feet to 7 feet; haulm delicate to medium, light, branching above ground level; internodes long; pods single, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 9 or 10 in pod, of very good flavour. Crop medium. Germination poor, and poor plant.

120. Moneymaker (J. K. King).—Height 6 feet to 7 feet 6 inches; haulm delicate, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 4 to $4\frac{1}{2}$ inches long, inflated, pale and dark; peas large, 8 or 9 in pod, tightly packed, of fair flavour. Crop good. Of 'Alderman' type, but a few differences.

119. Ne Plus Ultra (Sydenham), XX August 8, 1916.—Height 7 feet to 8 feet; haulm medium to sturdy, light, branching above ground level; internodes short; pods single or in pairs, curved, blunt, 3 to $3\frac{1}{2}$ inches long, inflated, pale; peas large, 6 or 7 in pod, tightly packed, excellent flavour. Crop good.

99. Prior (Eckford).—Height 6 feet to 8 feet 6 inches; haulm medium to sturdy, light, branching at ground level; internodes long; pods mostly single, curved, pointed, $4\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 9 or 10 in pod, tightly packed, of good flavour. Crop good.

108. The 'V.C.' (Sutton), XX August 8, 1916.—Height 6 feet to 7 feet 6 inches; haulm of medium strength, light, branching above ground level; internodes long; pods single or in pairs, curved, pointed, $5\frac{1}{2}$ to 6 inches long, inflated, pale; peas large, 8 in pod, of fair

flavour. Crop medium. Point of pod at side, and 13 peas in some pods. Rather paler than 'Quite Content.'

92. Thousandfold (Hurst).—Height 7 feet to 8 feet; haulm medium to delicate, dark, branching at ground level; internodes of medium length; pods in pairs, many in threes, slightly curved, blunt, 3 to 3½ inches long, inflated, pale; peas of medium size, 7 in pod, tightly packed, of fair flavour. Crop good.

118. Warriston Wonder (Bell).—Height 7 feet to 8 feet; haulm medium to sturdy, light, branching above ground level; internodes long; pods mostly single, slightly curved, blunt, 4 to 4½ inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of very good flavour; seed grey-green. Crop good.

111. Up-to-Date (Sutton), XX August 8, 1916.—Height 6 feet to 7 feet 6 inches; haulm delicate to sturdy, light, branching above ground level; internodes long; pods mostly single, curved, pointed, 5 to 5½ inches long, inflated, dark; peas large, 8 or 9 in pod, tightly packed, of very good flavour. Crop good.

| | No. | Name. | Ready. | No. of days between germination and | | | Flower- ing node. | Slat- ing time in days. | Mildew or not. |
|----------------------------------|---------------------------------------|-----------------------------|--------|-------------------------------------|-----------------|-------------------|----------------------|----------------------------------|-------------------|
| | | | | 1st flower. | Full flower. | Ready to pick. | | | |
| FIRST MID-SEASON VARIETIES. | | | | | | | | | |
| Over 1½ and under 3 ft. | Seed round, green | 6 Blue Beauty | July | 47 | 61 | 90 | 10-12 | 4-8 | Slight |
| | | 5 Buttercup | 18 | 57 | 64 | 90 | 11-13 | 6 | |
| | | 4 Pride of the Market | 15 | 52 | 59 | 81 | 13-17 | 7 | Mildew |
| | | 45 Second Early Round | 15 | 47 | 61 | 87 | 9 | 4-8 | " |
| | Seed wrinkled, green | 1 Daisy. | 15 | 45 | 59 | 81 | 9-12 | 7-8 | |
| | | 11 Favourite | 8 | 41 | 59 | 84 | 8-9 | 4 | None |
| | Seed wrinkled, green and yellow | 2 Daisy. | 14 | 37 | 54 | 81 | 9 | 4-6 | Mildew |
| | | 3 The Sherwood | 14 | 41 | 59 | 81 | 8-10 | 3-8 | |
| | | 8 Warwickshire Pride | 17 | 52 | 69 | 88 | 12-14 | 4-6 | Slight |
| | | 14 Yorkshire Hero | 21 | 52 | 65 | 90 | 13 | 8 | Mildew |
| Above 3 and under 4½ ft. | Seed wrinkled, green | 43 Abundance | 15 | 40 | 57 | 84 | 10-11 | 3-4 | Slight |
| | | 12 Commonwealth | 12 | 55 | 67 | 77 | 12-14 | 7 | None |
| | | 21 Discovery | 21 | 46 | 61 | 93 | 10 | 5-8 | " |
| | | 22 " | 20 | 58 | 68 | 92 | 12-13 | 6 | " |
| | 25 Dr. McLean, Im- proved Strain | 20 | 58 | 68 | 92 | 13 | 6 | " | |
| | Seed wrinkled, green | 23 King Edward | 14 | 49 | 61 | 86 | 10 | 4-6 | |
| | | 19 Majestic | 20 | 54 | 62 | 89 | 14 | 6 | Mildew |
| | | 26 Peerless | 20 | 61 | 70 | 96 | 12 | 6 | None |
| | | 27 " | 20 | 58 | 65 | 92 | 14 | 5 | " |
| | Seed wrinkled, green and yellow | 28 Senator | 17 | 51 | 61 | 89 | 13 | 9 | Mildew |
| 15 Stratagem | | 18 | 55 | 65 | 87 | 12 | 3-4 | None | |
| 16 Stratagem (extra selected) | | 18 | 54 | 63 | 84 | 10 | 4 | Mildew | |
| 31 Territorial | | 12 | 41 | 56 | 84 | 8 | 5-7 | None | |
| 13 Unique | | 20 | 49 | 62 | 89 | 12-14 | 4-8 | Mildew | |
| 7 Evergreen Delica- tesse | | 18 | 42 | 57 | 84 | 11-14 | 8 | Slight | |
| 54 Magnum Bonum, selected | | 19 | 58 | 70 | 93 | 14 | 6 | None | |
| 32 Perfection | | 24 | 58 | 67 | 93 | 14 | 5 | " | |

| | No. | Name. | Ready. | No. of days between germination and | | | Flower- ing node. | Slat- ing time in days. | Mildew or not. | | |
|--------------------------|------------------------------|-------------------------------|--------------------|-------------------------------------|-----------------|-------------------|----------------------|----------------------------------|-------------------|--------|------|
| | | | | 1st flower. | Full flower. | Ready to pick. | | | | | |
| Above 4½ and under 6 ft. | | | | | | | | | | | |
| Seed round, green | 78 | Victorious . . | July | 12 | 52 | 62 | 84 | 10 | 4-7 | Mildew | |
| | 17 | Danby Stratagem | 17 | 60 | 67 | 91 | 11-13 | 5 | None | | |
| | 80 | Dawn | 14 | 51 | 61 | 86 | 12 | 12 | 3-7 | Mildew | |
| | 73 | Edwin Beckett . | 12 | 43 | 52 | 81 | 11 | 3-5 | " | | |
| | 65 | Improved Queen . | 24 | 60 | 67 | 98 | 13 | 6 | None | | |
| | 30 | Plentiful . . . | 19 | 58 | 66 | 91 | 14 | 6 | " | | |
| | 64 | Rod Cross . . . | 19 | 53 | 63 | 83 | 14-17 | 8 | " | | |
| | 17 | Royal Salute . . | 20 | 60 | 67 | 94 | 13 | 7 | " | | |
| | 71 | Seedling 230 . . | 15 | 55 | 70 | 87 | 15 | 3-6 | Mildew | | |
| | 42 | Gradus | 12 | 41 | 51 | 87 | 10 | 6 | " | | |
| | 51 | Jersey Hero . . | 14 | 61 | 68 | 86 | 17 | 7 | " | | |
| | 79 | Constellation . . | 13 | 52 | 59 | 84 | 12 | 8 | Mildew | | |
| | 106 | Market King . . | 12 | 54 | 60 | 86 | 14 | 4-7 | " | | |
| | 105 | Profusion . . . | 21 | 57 | 67 | 95 | 15 | 6 | None | | |
| | Seed round yellow | 107 | Multiple | 20 | 57 | 67 | 94 | 14 | 8 | Mildew | |
| 95 | | Alderman . . . | 14 | 60 | 67 | 88 | 15 | 5 | None | | |
| 116 | | Clipper | 20 | 55 | 65 | 92 | 15 | 7 | Mildew | | |
| 97 | | Duke of Albany, selected | 20 | 52 | 65 | 92 | 14 | 8-9 | " | | |
| 98 | | Duke of Albany, reselected | 14 | 61 | 68 | 86 | 15 | 7 | " | | |
| 81 | | Essex Wonder . . | 20 | 49 | 64 | 86 | 14 | 7 | " | | |
| 84 | | Exhibition . . . | 20 | 57 | 64 | 91 | 15 | 6 | Budily | | |
| 86 | | Harvestman . . . | 14 | 52 | 61 | 86 | 13 | 9 | " | | |
| 85 | | International . . | 14 | 54 | 61 | 88 | 15 | 9 | " | | |
| 114 | | King George . . | 17 | 55 | 65 | 89 | 15 | 8 | Mildew | | |
| 87 | | Market Gardener . | 12 | 43 | 61 | 84 | 15 | 3-5 | Budily | | |
| 94 | | Model Telephone . | 20 | 51 | 65 | 92 | 14 | 10 | Mildew | | |
| 72 | | Premier | 20 | 43 | 61 | 92 | 15 | 5 | " | | |
| 109 | | Prince of Peas . . | 14 | 51 | 61 | 86 | 14 | 7 | " | | |
| Seed wrinkled, green | | 70 | Queen Mary . . . | 14 | 47 | 61 | 86 | 14 | 5 | " | |
| | 112 | Quite Content . . | 20 | 55 | 65 | 92 | 14 | 9 | " | | |
| | 113 | Reliance Marrowfat | 17 | 55 | 65 | 89 | 14 | 8 | " | | |
| | 88 | Saccharine . . . | 20 | 55 | 65 | 92 | 14 | 6 | " | | |
| | 93 | Standard | 21 | 52 | 65 | 93 | 15 | 9 | None | | |
| | 90 | Stourbridge Marrow | 15 | 52 | 65 | 87 | 14 | 9 | Mildew | | |
| | 115 | Seedling 231 . . | 14 | 55 | 65 | 86 | 12-14 | 4-6 | " | | |
| | 77 | Seedling 231 . . | 21 | 51 | 65 | 93 | 14 | 9 | " | | |
| | 96 | Alderman | 20 | 55 | 65 | 92 | 14 | 7 | None | | |
| | 100 | Battleship . . . | 21 | 54 | 63 | 95 | 14 | 8-9 | " | | |
| | 101 | Duke of York . . | 20 | 52 | 65 | 92 | 14 | 8 | Mildew | | |
| | SECOND MID-SEASON VARIETIES. | | | | | | | | | | |
| | Above 3 and under 4½ ft. | | | | | | | | | | |
| | Seed wrinkled, green | 46 | Delicatesse . . . | July | 21 | 55 | 62 | 90 | 13 | 5 | None |
| | | 66 | Glory of Devon . . | 29 | 61 | 70 | 101 | 15 | 6 | Mildew | |
| 67 | | " " | 24 | 60 | 67 | 98 | 14 | 6 | None | | |
| 68 | | " " | 20 | 58 | 67 | 98 | 15 | 4 | " | | |
| 24 | | Invincible | 28 | 55 | 65 | 97 | 13 | 5 | " | | |
| 53 | | Magnum Bonum . . | 29 | 58 | 70 | 101 | 14 | 6 | " | | |
| 10 | | Nonsuch | 29 | 52 | 64 | 95 | 10-12 | 4 | " | | |
| 48 | | Paragon | 24 | 58 | 65 | 95 | 13 | 7 | " | | |
| 20 | | Prizewinner . . . | 24 | 58 | 67 | 93 | 12 | 4 | Slight | | |
| 76 | | Scotsman | 29 | 58 | 70 | 101 | 12 | 6 | Mildew | | |
| 59 | | Superlative . . . | 29 | 58 | 70 | 101 | 14 | 6 | None | | |
| 69 | | " " | 29 | 58 | 70 | 101 | 14 | 6 | " | | |
| 82 | | William Richardson | 28 | 61 | 70 | 100 | 14 | 8 | " | | |
| 83 | | " " | 29 | 60 | 69 | 100 | 14 | 4 | " | | |
| Seed wrinkled, yellow | | 69 | Sensation | 29 | 52 | 64 | 95 | 14 | 6 | " | |
| | 33 | Perfection . . . | 30 | 52 | 64 | 96 | 10 | 6 | " | | |
| | 74 | Lancastrian . . . | 22 | 60 | 64 | 93 | 15 | 4 | " | | |
| | 40 | Magnificent . . . | 24 | 60 | 74 | 95 | 14 | 4 | " | | |
| | 44 | Prizewinner . . . | 29 | 48 | 70 | 101 | 14 | 4-7 | " | | |
| | 41 | Satisfaction . . . | 29 | 58 | 70 | 101 | 13 | 5 | " | | |

| | No. | Name | Ready. | No. of days between germination and | | | Flower- ing mode. | Slat- ing time in days. | Mildew or not. |
|-----------------------------|-----|-------------------|--------|-------------------------------------|-----------------|-------------------|----------------------|-------------------------------------|-------------------|
| | | | | 1st flower. | Full flower. | Ready to pick. | | | |
| Above 4 1/2 and under 6 ft. | | | July | | | | | | |
| | 57 | Best of All | 24 | 58 | 70 | 96 | 14 | 5 | None |
| | 58 | | 24 | 60 | 69 | 95 | 14 | 4 | " |
| | 56 | Continuity | 24 | 61 | 69 | 96 | 14 | 5 | " |
| | 34 | Eureka | 25 | 57 | 69 | 96 | 12 | 4 | " |
| | 29 | G. F. Wilson | 24 | 51 | 61 | 95 | 12 | 4-7 | " |
| | 61 | Incomparable | 24 | 61 | 70 | 95 | 14 | 4 | " |
| | 55 | Masterpiece | 24 | 61 | 69 | 96 | 14 | 4 | " |
| | 63 | Matchless | 29 | 61 | 69 | 101 | 11 | 7 | " |
| | 89 | Nonsuch Marrowfat | 24 | 58 | 70 | 96 | 15 | 7 | " |
| | 52 | Perpetual | 21 | 61 | 72 | 93 | 11 | 5 | " |
| | 50 | Prolific Marrow | 24 | 58 | 67 | 93 | 14 | 5 | " |
| | 62 | Supremacy | 24 | 55 | 65 | 96 | 11 | 7 | " |
| | 18 | The Victor | 21 | 58 | 68 | 96 | 11-12 | 5 | Mildew |
| | 91 | Union Jack | 20 | 52 | 62 | 89 | 14 | 9 | " |
| | | | | | | | | | |
| | 35 | Eureka | 23 | 57 | 65 | 99 | 12 | 6 | None |
| Over 6 ft. | | | | | | | | | |
| | 103 | Telegraph | 20 | 49 | 67 | 94 | 15 | 4-6 | Mildew |
| | 104 | Universal | 21 | 54 | 67 | 95 | 14 | 8 | None |
| | 110 | Centenary | 20 | 51 | 65 | 92 | 14 | 7-9 | Mildew |
| | 117 | Hercules | 20 | 51 | 66 | 89 | 14-15 | 6-7 | " |
| | 108 | The 'V.C.' | 20 | 55 | 65 | 92 | 14 | 6-7 | " |
| | 92 | Thousandfold | 29 | 63 | 72 | 103 | 16 | 9 | None |
| | 118 | Warrior Wonder | 20 | 55 | 65 | 92 | 14-15 | 8 | Mildew |
| | 111 | Up-to-Date | 20 | 51 | 70 | 92 | 14-16 | 7-9 | " |
| | | | | | | | | | |
| | 121 | Goldfinder | 24 | 58 | 67 | 93 | 14 | 7 | None |
| | 102 | General Joffre | 21 | 47 | 61 | 93 | 14 | 5-7 | Mildew |
| | 120 | Moneymaker | 20 | 57 | 64 | 91 | 15 | 6 | None |
| | 119 | Ne Plus Ultra | 24 | 61 | 65 | 96 | 14-16 | 7 | " |
| | 99 | Prior | 24 | 47 | 66 | 96 | 14 | 5 | " |
| | 75 | The Gladstone | 20 | 50 | 69 | 91 | 14 | 9 | Mildew |

LATE PEAS AT WISLEY, 1917.

FIFTY-EIGHT stocks of peas were sent for trial as late varieties in 1917. They were sown on May 5 in trenches which had a good dressing of manure applied during March and April. The ground in 1916 had been occupied by cabbages. The sowing was early for late peas, but the Wisley rainfall being usually light the comparatively early sowing and elimination of all varieties which came in before a fixed date were considered the best means of securing a fair trial. In spite of the dry weather following sowing, germination of all the stocks was excellent and good growth was made. The Fruit and Vegetable Committee examined the trial on July 27 and eliminated the varieties which could not be considered late ones, and finally judged them on August 17, recommending awards as noted below.

Awards recommended in the present trial.

Award of Merit.

- 24. Latest of 11, sent by Messrs. Barr.
- 57, 58. Longstander, sent by Messrs. Sutton and Messrs. Barr.
- 42. Rearguard, sent by Messrs. Hurst.

Highly Commended (XXX).

- 30. Autocrat, sent by Messrs. Simpson.
- 23. Perpetual Bearer, sent by Messrs. Barr.
- 2. Reliable, sent by Messrs. Harrison.
- 12, 14. The Gladstone, sent by Messrs. Simpson and Barr.

Commended (XX).

- 25. Anticipation, sent by Messrs. Carter.
- 20. Late Queen, sent by Messrs. Nutting.
- 45. Michaelmas, sent by Messrs. Barr.
- 55. Ne Plus Ultra, selected, sent by Messrs. Barr.

Of these, stocks under the same name had received awards in previous trials as follows: Autocrat (F.C.C. 1885, J. Veitch); The Gladstone (F.C.C. 1902, Mr. Holmes); Late Queen (A.M. 1900, Messrs. Barr).

Of other stocks in the trial the following under the same name had in earlier years received awards, but they were this season adjudged of less merit than those to which awards were recommended: Nos. 27, 28. Continuity (A.M. July 1898, and August 1916, Messrs. Sutton).

VARIETIES.

- | | |
|-------------------|------------------|
| †1. *Superb. | †4. Stratagem. |
| 2. Reliable. | 5. } Englishman. |
| †3. James Kelway. | 6. } |

* See footnote, p. 107.

† These varieties were ready before July 27, and are to be regarded as early or mid-season varieties. They are therefore not further referred to.

| | |
|-----------------------------|----------------------------------|
| 17. } Glory of Somerset. | 33. } Autocrat. |
| 18. } Veitch's Perfection. | 34. } Glory of Ross. |
| 19. } Walker's Perpetual. | 35. } Glory of Devon. |
| †10. } Follower. | †36. } Hancock's Exhibition. |
| 12. } | 37. } Sutton's Exhibition. |
| 13. } | †38. } Matchless. |
| 14. } The Gladstone. | †39. } Matchless Marrowfat. |
| 15. } | 40. } Lord Leicester. |
| 16. } | 41. } Rearguard. |
| 17. } Selected Gladstone. | 42. } Latest Giant. |
| †18. } Sutton's Perfection. | 43. } |
| 19. } Late Queen. | 44. } Michaelmas. |
| 20. } | 45. } |
| 21. } Dreadnought. | 46. } The Langport. |
| 22. } | †47. } Old England. |
| 23. } Perpetual Bearer. | †48. } Good Indeed. |
| 24. } Latest of All. | 49. } The Britisher. |
| 25. } Anticipation. | 50. } Alderman Selected. |
| 26. } Sutton's Perpetual. | †51. } Achievement. |
| 27. } Continuity. | †52. } Late Duke. |
| 28. } | 53. } Ne Plus Ultra re-selected. |
| 29. } Victory. | 54. } Ne Plus Ultra selected. |
| 30. } | 55. } Goldfinder. |
| 31. } Autocrat. | 56. } |
| 32. } | 57. } Longstander. |
| | 58. } |

DESCRIPTIONS AND NOTES.

NOTE.—In order to reduce the length of descriptions as far as possible the following particulars, which are not repeated in the description below, are given in the Table (p. 520), viz.: Seed colour and form, the date when the crop was ready for picking, the number of days between germination and first flowering, full flowering and maturing of crop, the number of days to "slatting," that is between flowering and the appearance of the developing pod, and whether mildew-free or not. These particulars may be easily ascertained by reference to the Table under the number of the variety tried.

Above 3 feet and under 4½ feet.

25. Anticipation (Carter), XX Aug. 17, 1917.—Height, 4 feet; haulm sturdy, dark, branching at and above ground level; internodes short; pods borne singly and in pairs, straight, pointed, 4–5 inches long, inflated, pale; peas large, 6 to 8 in pod, tightly packed, and of good flavour; seed grey-green. Crop good.

27, 28. Continuity.—See p. 512.

37. Exhibition (Hancock).—Height, 3 feet 6 inches to 4 feet; haulm sturdy, dark, branching at and above ground level; internodes short; pods borne mostly singly, slightly curved, pointed, 4 to 5 inches long, inflated, dark; peas large, 7 or 8 in pod, tightly packed, and of fair flavour. Crop poor.

35. Glory of Ross (Holmes).—Height, 3 feet to 3 feet six inches; haulm sturdy, dark, branching at and above ground level; internodes short; pods single or in pairs, curved, pointed, 4 to 5 inches long, inflated, pale; peas large, 7 to 10 in pod, tightly packed, of fair flavour. Crop good.

43, 44. Latest Giant (Barr, Carter).—Height, 3 feet to 4 feet;

† These varieties were ready before July 27, and are to be regarded as early or mid-season varieties. They are therefore not further referred to.

haulm sturdy, dark, branching at and above ground level; internodes short; pods borne singly and in pairs, curved, pointed, $3\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, tightly packed, and of good flavour. Crop good. No. 44 had some straight-podded rogues.

23. Perpetual Bearer (Barr), XXX Aug. 17, 1917.—Height, 4 feet to 4 feet 6 inches; haulm sturdy, dark, branching at and above ground level; internodes short; pods borne mostly in pairs, curved, blunt, 3 to $3\frac{1}{2}$ inches long, pale; peas large, 6 or 7 in pod, tightly packed, and of fair flavour. Crop good.

2. Reliable (Harrison), XXX Aug. 17, 1917.—Height, 4 feet to 4 feet 6 inches; haulm fairly sturdy, variable, dark, branching at and above ground level; internodes rather long; pods borne singly, straight, pointed, 3 to 4 inches long, dark; peas of medium size, 7 to 9 in pod, tightly packed, and of fair flavour; seed green, a few yellow.

29. Victory (Hurst).—Height, 3 feet 6 inches to 4 feet 6 inches; haulm rather delicate, light, branching at and above ground level; internodes of medium length; pods borne singly and in pairs, curved, pointed, 4 to $4\frac{1}{2}$ inches long, pale; peas large, 8 or 9 in pod, tightly packed, and of good flavour; seed grey-green. Crop good. Several rogues, stronger with larger pods.

Above $4\frac{1}{2}$ feet and under 6 feet.

30, 31, 32, 33, 34. Autocrat (Simpson, Sydenham, Barr, R. Veitch, Nutting; J. Veitch), No. 30, XXX Aug. 17, 1917.—Height, 4 feet to 5 feet; haulm very sturdy, dark, branching at and above ground level; internodes short; pods borne mostly singly, straight, blunt, 3 to 4 inches long, inflated, dark; peas large, 6 to 8 in pod, tightly packed and of good flavour. Crop good. Nos. 31, 32, 33, 34, had each one or two rogues.

21, 22. Dreadnought (Barr, Carter).—Height, 4 feet to 5 feet; haulm sturdy, dark, branching at and above ground level; internodes short; pods borne mostly singly, straight, blunt, $3\frac{1}{2}$ to $4\frac{1}{2}$ inches long, inflated, dark; peas large, 6 to 8 in pod, tightly packed, and of good flavour. Crop good. No. 21 had seeds of two colours.

5. 6. Englishman (Kelway, Barr).—Height, 4 feet to 5 feet; haulm sturdy, dark, branching at and above ground level; internodes long; pods borne singly and in pairs, curved, pointed, $3\frac{1}{2}$ to 5 inches long, inflated, dark; peas large, 6 to 9 in pod, tightly packed, and of good flavour. Crop good. No. 5 had some light-podded rogues and seeds of two colours, and in No. 6 the pods were only slightly curved and the haulm was variable in strength.

53. Late Duke (Carter).—Height, 5 to 6 feet; haulm delicate, pale, branching at and above ground level; internodes long; pods curved, pointed, 4 to 5 inches long, inflated, dark; peas large, 7 to 9 in pod, tightly packed, of good flavour. Crop good.

19, 20. Late Queen (Sutton, Nutting), No. 20 **XX** Aug. 17, 1917.—Height, 5 feet to 5 feet 6 inches; haulm sturdy, dark, branching at and above ground level; internodes short; pods borne singly and in pairs, straight, blunt, $3\frac{1}{2}$ to 4 inches long, very inflated, dark; peas large, 5 to 7 in pod, packed rather loosely, and of good flavour. Crop good. No. 19 had some rogues with smaller pods, and was more single-podded, with crop only fair.

24. Latest of All (Barr), **A.M.** Aug. 17, 1917.—Height, 5 feet; haulm sturdy, dark, branching at and above ground level; internodes short; pods produced singly and in pairs, straight, blunt, 3 to 4 inches long, inflated, dark; peas large, 6 to 8 in pod, and of good flavour. Crop good.

40. Matchless Marrowfat (Barr).—A mixed stock.

45, 46. Michaelmas (Barr, Carter), No. 45 **XX** Aug. 17, 1917.—Height, 4 feet to 5 feet; haulm sturdy, dark, branching at and above ground level; internodes short; pods produced mostly singly, straight, some slightly curved, blunt, 3 to 4 inches long, inflated, dark; peas large, 6 to 8 in pod, tightly packed, and of good flavour. Crop good. No. 45 had several tare-leaved rogues, and some with pointed pods.

26. Perpetual (Sutton), **A.M.** Aug. 8, 1916.—Height, 4 feet to 5 feet; haulm sturdy, dark, branching at and above ground level; internodes short; pods produced singly and in pairs, straight, pointed, 4 to $4\frac{1}{2}$ inches long, much inflated, dark; peas large, 7 or 8 in pod, tightly packed, and of good flavour. Crop good.

42. Rearguard (Hurst), **A.M.** Aug. 17, 1917.—Height, 4 feet to 5 feet 6 inches; haulm sturdy, dark, branching at and above ground level; internodes short; pods borne mostly singly, curved, pointed, $4\frac{1}{2}$ to $5\frac{1}{2}$ inches long, inflated, dark, peas large, 8 to 10 in pod, tightly packed, and of fair flavour. Crop good.

50. The Britisher (Kelway).—Height, 3 feet 6 inches to 4 feet; haulm sturdy, dark, branching at and above ground; internodes short; pods mostly in pairs, nearly straight, pointed, 4 to 5 inches long, inflated, dark; peas large, 7 to 10 in pod, tightly packed, of fair flavour. Crop good. Not quite true.

12, 13, 14, 15, 16, 17. The Gladstone (Simpson, Hurst, Barr Sydenham, R. Veitch, Sutton), Nos. 12 and 14, **XXX** Aug. 17, 1917.—Height, $4\frac{1}{2}$ feet to 5 feet; haulm sturdy, dark, branching at and above ground level; internodes long; pods borne mostly singly, curved, pointed, 4 to 5 inches long, inflated, dark; peas large, 7 to 9 in pod, tightly packed, and of good flavour. Crop good. No. 17 is called The Gladstone Selected, and had green seeds. No. 12 had green seed and some rogues with blunt and light pods. Nos. 13 and 16 had shorter nodes. In No. 16 the pods were lighter in colour.

Over 6 feet.

57, 58. Longstander (Sutton, Barr), **A.M.** Aug. 17, 1917.—Height, 6 feet to 8 feet; haulm rather delicate, light, branching at and above

ground level ; internodes long ; pods mostly singly, slightly curved, blunt, 4 to 5 inches, inflated, dark ; peas large, 6 to 8 in pod, tightly packed, and of good flavour. Crop good. No. 58 had green seeds, was dwarfer than 57, and crop not so heavy.

54, 55. Ne Plus Ultra re-selected (Carter, Barr). See p. 515.

| | No. | Name. | Ready. | No. of days between germination and | | | Flowering node. | Slat-ting time in days. | Mildew or not. |
|---------------------------------|-------------------------|---------------------------------|--------------------|-------------------------------------|--------------|----------------|-----------------|-------------------------|----------------|
| | | | | 1st flower. | Full flower. | Ready to pick. | | | |
| Over 3 and under 4 ft. | Seed wrinkled, green | 25 Anticipation . . . | Aug. 13 | 34 | 52 | 83 | 13 | 6 | Slight |
| | | 27 Continuity . . . | 13 | 31 | 52 | 80 | 16-17 | 6 | Badly |
| | | 28 " . . . | 13 | 32 | 53 | 80 | 16-17 | 5-6 | " |
| | | 37 Exhibition . . . | 8 | 31 | 49 | 81 | 15-16 | 6-7 | " |
| | | 35 Glory of Ross . . . | 8 | 34 | 49 | 81 | 15-16 | 6-7 | None |
| | | 43 Latest Giant . . . | 8 | 34 | 55 | 81 | 14-15 | 5-6 | Slight |
| | Seed wrinkled, yellow | 44 " . . . | 10 | 32 | 54 | 82 | 16 | 5-6 | Badly |
| | | 2 Reliable " . . . | 8 | 23 | 55 | 80 | 18-19 | 5-6 | Mildew |
| | | 29 Victory . . . | 8 | 27 | 46 | 75 | 16-17 | 5-6 | " |
| | | Perpetual Bearer . . . | 13 | 36 | 49 | 83 | 17 | 7-8 | None |
| | | 22 Dreadnought . . . | 13 | 38 | 50 | 80 | 17 | 6-7 | Mildew |
| | | 6 Englishman . . . | 6 | 33 | 58 | 80 | 15-16 | 5-6 | " |
| | Over 4½ and under 6 ft. | Seed wrinkled, green | 12 Gladstone . . . | July 30 | 32 | 53 | 67 | 18 | 7-8 |
| 13 " . . . | | | Aug. 30 | 39 | 57 | 73 | 17-18 | 5-6 | " |
| 17 " selected . . . | | | Aug. 4 | 37 | 54 | 75 | 21-22 | 5-6 | " |
| 19 Late Queen . . . | | | 15 | 37 | 50 | 81 | 17 | 5-6 | " |
| 20 " . . . | | | 15 | 38 | 51 | 81 | 17 | 6-7 | " |
| 24 Latest of All . . . | | | 17 | 38 | 51 | 83 | 15-16 | 6-7 | Slight |
| Seed wrinkled, green and yellow | | 15 Michaelmas . . . | 17 | 39 | 56 | 91 | 17-18 | 8-9 | Badly |
| | | 46 " . . . | 17 | 41 | 57 | 91 | 17 | 5-6 | " |
| | | 26 Perpetual . . . | 13 | 45 | 64 | 82 | 18 | 5-6 | Slight |
| | | 42 Rearguard . . . | 17 | 45 | 55 | 91 | 15-16 | 6-7 | " |
| | | 30 Autocrat . . . | 17 | 35 | 55 | 85 | 17 | 6 | Mildew |
| | | 31 " . . . | 17 | 44 | 60 | 90 | 17 | 7-8 | Slight |
| Over 6 ft. | | Seed wrinkled, green and yellow | 32 " . . . | 17 | 42 | 58 | 92 | 15-16 | 6-7 |
| | 33 " . . . | | 17 | 36 | 59 | 91 | 17-18 | 6-7 | " |
| | 34 " . . . | | 15 | 41 | 59 | 89 | 15-16 | 5-6 | " |
| | 21 Dreadnought . . . | | 13 | 33 | 47 | 81 | 18 | 5-6 | None |
| | 5 Englishman . . . | | 10 | 35 | 54 | 81 | 16 | 5-6 | Slight |

REPORT OF THE CONSULTING CHEMIST FOR 1917.

By Dr. J. A. VOELCKER, M.A., F.I.C., F.L.S., &c.

THE applications made in 1917 to the Consulting Chemist were more numerous than in 1916, twenty-eight samples being sent for analysis in place of thirteen in the previous year. These analyses comprised :

| | |
|-----------------------------------|----------|
| Meat meal | 1 |
| Poultry manure | 1 |
| Potash materials | 4 |
| Concentrated manure | 1 |
| Hair waste | 1 |
| Destructor refuse | 1 |
| Sewage sludge | 1 |
| Compressed oats mixture | 1 |
| Waters | 2 |
| Soils | 15 |
| | <hr/> 28 |

1. *Meat Meal*.—This was sold as containing 30 per cent. of phosphates and 8·5 per cent. of ammonia, the price charged being, in November 1917, £16 a ton. Analysis showed it to have :

| | |
|----------------------|-----------|
| | Per cent. |
| Phosphates | 24·99 |
| Ammonia | 9·32 |

There was, thus, a deficiency of 5 per cent. of phosphates and an excess of 0·80 per cent. in ammonia, these about balancing one another in value; but the price was an exceedingly high one, and should not have been nearly so much.

2. *Poultry Manure*.—The sample sent of this gave :

| | |
|---|--------------|
| | Per cent. |
| Moisture | 56·80 |
| Organic matter and salts of ammonia | 18·11 |
| *Phosphoric acid | 1·50 |
| Lime | 9·00 |
| Magnesia, alkalies, &c. | 6·94 |
| Sand | 7·65 |
| | <hr/> 100·00 |
| Nitrogen | 1·02 |
| Equal to ammonia | 1·24 |
| *Equal to phosphate of lime | 3·28 |

3. *Potash Materials*.—The search for materials containing potash has been, in the absence of the German potash salts, very active, and the need of them has been particularly felt in the horticultural world. Consequently, a number of materials have been examined in the hope of their containing potash. Three such were the following :

| | A | B | C |
|--|-----------|-----------|-----------|
| | Per cent. | Per cent. | Per cent. |
| Moisture | 3.38 | 4.81 | 7.87 |
| Organic matter | 7.06 | 5.31 | 8.02 |
| Mineral matters insoluble in water | 72.40 | 68.50 | 71.50 |
| Mineral matters soluble in water | 17.16 | 21.38 | 12.61 |
| | 100.00 | 100.00 | 100.00 |
| Potash (total) | 13.35 | 16.98 | 13.16 |
| Equal to sulphate of potash | 24.71 | 31.43 | 24.36 |

These all contained distinctly good amounts of potash, and, as the price in each case was only 7s. 6d. per unit of sulphate of potash, they were quite worth getting in these times when potash is so much required and supplies are so scarce.

At the same time they were all of them markedly alkaline, though both chloride and sulphate of potash were present, and it would not do to use them mixed with sulphate of ammonia or other ammonia-containing manures, as ammonia would be thereby lost.

Another material sent for estimation of potash was a waste vegetable product, and this analysed as follows :

| | Per cent. |
|---------------------------------------|-----------|
| Moisture | 12.64 |
| Organic matter | 76.65 |
| *Phosphoric acid | 1.04 |
| Lime | 0.83 |
| Oxide of iron, alkalies, &c. | 5.04 |
| Siliceous matter | 3.80 |
| | 100.00 |
| *Equal to phosphate of lime | 2.27 |
| Nitrogen | 2.95 |
| Equal to ammonia | 3.58 |
| Potash | 2.07 |

4. *Destructor Waste.*—The sample sent me was ash from a destructor in which the excreta of hospital patients was incinerated, and with it was mixed clinker and other waste material. The analysis was :

| | Per cent. |
|---------------------------------------|-----------|
| Moisture | 1.60 |
| Organic matter, carbon, &c. | 4.87 |
| Oxide of iron and alumina | 20.17 |
| *Phosphoric acid | 3.22 |
| Lime | 7.69 |
| Potash | 1.54 |
| Soda | 2.37 |
| Magnesia | 1.06 |
| Carbonic acid, chlorine, &c. | 2.63 |
| Insoluble siliceous matter | 54.85 |
| | 100.00 |
| *Equal to phosphate of lime | 7.03 |
| Nitrogen | 0.06 |
| Equal to ammonia | 0.07 |

This was distinctly richer than ordinary destructor waste, the amounts of phosphate of lime and potash being sufficiently high to

constitute manurial value apart from the mechanical advantages of using such material on land, especially heavy land, that wanted "opening out." The nature of the crude matter used, and the very complete burning, accounted largely for this superiority.

5. *Sewage Sludge*.—This material was being used to dig into garden soil. It was, however, of decidedly low quality and had, as will be seen, nearly 75 per cent. of water. It was reckoned to cost 5s. per ton; but this was more than it was worth, and, unless where soil may be deficient in vegetable matter or at all likely to "burn," it is doubtful if such sludge is worth applying.

The analysis was:

| | Per cent. |
|---------------------------------------|--------------|
| Water | 74.67 |
| Organic matter | 11.59 |
| Oxide of iron and alumina | 1.86 |
| Lime | 0.96 |
| Potash | 0.05 |
| *Phosphoric acid | 0.41 |
| Magnesia &c. | 1.14 |
| Sand | 9.32 |
| | <hr/> 100.00 |
| Nitrogen | 0.19 |
| Equal to ammonia | 0.23 |
| *Equal to phosphate of lime | 0.89 |

6. *Waters*.—In consequence of a complaint sent me that Peaches and Vines in several houses had been injured, while in others no harm had been experienced, an inquiry was pursued in respect of the water supply, and particulars were obtained as to what had been the treatment in the different houses. It was stated that the leaves of Peaches and Vines decayed after watering, and that with Tulips the flowers became spotted and the leaves died back. On the other hand, in a Vinery where only "damping" had been done, but no syringing, the Vines were unaffected.

It was ascertained that the water supply came from two sources, the one a lake, the other a well. The locality was in Dorsetshire, quite close to the sea. Water was normally raised from the lake by means of a ram, but, the ram having got out of order, the water from the well had been used all the winter and spring. The ram having been put in order again early in May, the supply from the lake was used on May 10, and by May 13 the injury aforesaid was noticed. I had samples of the two waters sent me, and the analyses of these were:

| | Lake water. Grains per gallon. | Well water. Grains per gallon. |
|---|-----------------------------------|-----------------------------------|
| Total solid matters | 200.48 | 20.16 |
| Oxydizable organic matter | 0.98 | 4.03 |
| Nitric acid as nitrates | 0.07 | 0.07 |
| Chlorine | 98.66 | 4.96 |
| Equal to chloride of sodium (common salt) | 162.49 | 8.18 |

It will be seen that the lake water contained a very excessive amount of salt, which probably had filtered in from the sea, and this undoubtedly had been the cause of the injury to the plants. The presence of

magnesia salts in some quantity in the lake water confirmed that it was sea water that had found its way in.

7. *Soils*.—Several samples were submitted to me, the majority, however, showing no special features. The following, however, may be of interest :

(a) Soil for apple trees. A partial analysis gave :

| (Soil dried at 100° C.) | | Per cent. |
|--|--|--------------|
| Organic matter and loss on heating | | 5·62 |
| Oxide of iron and alumina | | 7·22 |
| Lime | | 2·68 |
| Phosphoric acid | | 0·10 |
| Alkalies, &c. | | 1·40 |
| Insoluble silicates and sand | | 82·98 |
| | | <hr/> 100·00 |

The soil was one of loose, much broken-up character, and had had acetylene refuse dug into it. It contained some leaf mould, but, nevertheless, was not really rich in vegetable matter, and though there seemed to be ample lime, this was not well distributed through the soil, but collected in lumps. Further, the soil was decidedly poor in phosphoric acid, and, for apple-growing, should have phosphates applied to it freely, either as bone meal or as basic slag. I should consider the above not a good soil for apples, and that it wanted more consolidation as well as more manuring.

(b) *Soil for Fruit-growing*.—A sample of grass-land was sent me for the purpose of seeing if, when ploughed up, it would be suitable for fruit-growing, and eventually for apples and pears. A partial analysis gave :

| (Soil dried at 100° C.) | | Per cent. |
|--|--|--------------|
| Organic matter and loss on heating | | 10·42 |
| Oxide of iron and alumina | | 11·52 |
| Lime | | 0·66 |
| Phosphoric acid | | 0·15 |
| Magnesia, alkalies, &c. | | 1·09 |
| Insoluble silicates and sand | | 76·16 |
| | | <hr/> 100·00 |

Here, again, phosphoric acid is not sufficiently present, and, though there may not be an actual deficiency of lime, I should consider the further application of this desirable. In all such cases, too, it is very necessary to consider not merely the quality of the soil, but also whether there be a good depth of it.

DONORS OF SEEDS, PLANTS, BOOKS, &c., TO THE SOCIETY'S
LABORATORY AND GARDEN AT WISLEY DURING THE YEAR 1917.

- ALLGROVE, J. C., Slough. Raspberry 'The Devon.' Included in trial.
 ALLWOOD, Messrs., Haywards Heath. Collection of Perpetual Flowering Carnations.
 BACON, C. H., Sherborne. Achillea. Included in trial.
 BAKER, F. H., Melbourne, Australia. Seeds of Acacia &c. Sown.
 BAKER, Messrs., Codsall. *Chrysanthemum maximum* varieties (included in trial); *Gentiana lagodechiana* (planted in garden).
 BALFOUR, Prof. I. B., Edinburgh. *Primula chrysopa*. Growing on.
 BARR, Messrs., London. Stocks; Poppies (see p. 483); Broad Beans (see p. 160); Leeks; Peas (see p. 516); Beet (see pp. 488, 495); Potatoes; Medicinal Herbs (grown in garden); *Thunbergia Gibsoni* (plants raised); *Campanula* 'Telham Beauty' (planted in garden); Pumpkins and Squashes; Lettuce (included in trial); Spinach; Cow Wheat.
 BECKETT, E., V.M.H., Elstree. Collection of Shrubs. Planted in garden.
 BELL, D., Leith. Beet 'Bell's Deep Blood Red' (see p. 488); Broad Bean 'The Cropper' (see p. 160).
 BENNETT, Mrs., Louth. Seedlings of *Thalictrum dipterocarpum*. Planted in garden.
 BONAPARTE, Monsieur Le Prince, Paris. Papers for Library.
 BOND, Mrs., Wareham. Seed of German Lentils.
 BRANNAM, Messrs., Barnstaple. Flower pots for trial.
 BRODRIBB, A. H., Guildford. Hollyhock seed. To be sown.
 BROWN, Mrs., Brightstone, I.W. Seeds of various Olearias. Sown.
 BROWN, W., Mayfield. *Chrysanthemum maximum* 'Mayfield Giant.' Included in trial.
 BRUNTON, J. S., Burnley. 'Carnation Year Book.' For Wisley Library.
 BRYANS, A., London. Seeds from Kashmir. Sown.
 BUNYARD, E. A., Maidstone. Gordon's Pinetum. Deposited in Library.
 BUNYARD, Messrs., Maidstone. Broad Bean 'Bunyard's Prizetaker Exhibition Long Pod' (see p. 160); Beet 'Bunyard's Intermediate' (see p. 488); Raspberries (included in trial).
 BURPEE, Messrs. W. ATLEE, Philadelphia. Lettuces (included in trial); climbing Beans (to be tried 1918).
 CARTER, Messrs., Raynes Park. Beet and Lettuce. Included in trials.
 CLIBRANS, Messrs., Altrincham. Beet 'Deep Blood Red' (see p. 488).
 COLLIER, W. A., Redbourn. *Chrysanthemum maximum* 'Marion Collier.' Included in trial.
 COOPER, TABER & Co., Messrs., London. Lettuce and Beet (pp. 488, 495). Included in trials.
 CRANE, D. B., London. Seed of climber from Portuguese East Africa. Sown.
 CREWSON, W., St. Leonards-on-Sea. Seed of Japanese Radish and Corean White Cabbage.
 CUTBUSH, Messrs., Highgate. Perpetual-flowering Carnations.
 CUTBERTSON, F. G., San Francisco. Seeds of *Clarkia pulchella* and *C. elegans* for comparison.
 DANIELS, Messrs., Norwich. Beet and Lettuce. Included in trials.
 DAWKINS, A., Chelsea. Beet and Lettuce. Included in trials.
 DAWSON, C., Christchurch. Collection of seeds from Salonica and neighbourhood. Sown.
 DIVERS, W. H., V.M.H., Grantham. Rhubarb 'Tobolsk'; *Anemone Pulsatilla* 'Belvoir Red'; *Aconitum septentrionale* (planted in garden); eyes of Grape 'Black Morecco' (growing on). Winter-flowering Begonia seed.
 DOBBIE, Messrs., Edinburgh. Poppies (see p. 483); Onions (see pp. 147, 156); Pea 'Dobbie's Selected Alderman' (see p. 516); Broad Beans (see p. 160); Leeks; Beet (see p. 488); Shallot 'Dobbie's Large Red Exhibition' (see p. 146); artificial manure for potatoes; Lettuce (included in trial); cuttings of *Pelargonium regale* x *tomentosum* (growing on).
 DUNEDIN BOTANIC GARDEN, New Zealand. Collection of seeds. Plants raised for distribution.
 FIDLER, Messrs., Reading. Potato 'St. Malo Kidney' (see p. 135).

- FLEMYNG, Rev. W. W., Waterford. Seeds of *Eucalyptus coccifera*, *Pyrus japonica*, and *Asalea mollis*. Sown.
- FLETCHER, Messrs., Ottershaw. Seedling Aucuba. Planted in garden.
- FORBES, Messrs., Hawick. Stocks.
- FRASER, G., Ucluelet, British Columbia. Hybrid Gooseberries. Planted in collection.
- FRENCH, Messrs., Birmingham. No. 4 Pneumatic Sprayer.
- FULFORD, F., Tarbolton. P.F. Carnation 'Mrs. James Arthur.'
- GALT, A. S., Leeds. Cuttings of Apple 'Fillingham Pippin.'
- GARDINER, W. H., Thorington. Seeds of *Eschscholzia* (see p. 167).
- GODFREY, W. J., Exmouth. *Chrysanthemum maximum* 'Star of Devon' and 'Omega.' Included in trial.
- GRANT-DALTON, Miss, Sway. Single pink. Planted in garden.
- GRAY, Z., Sandy. Onions (see p. 156).
- GREAVES, Miss, Reigate. Seed of *Lonicera quinquelocularis*. Some sown, remainder distributed to Fellows.
- GREGORY, Mrs., Leatherhead. Corms of Italian Cyclamen. Planted in garden.
- HAMILTON, W. F., Lymington. P.F. Carnation 'Elspeth.'
- HANBURY, C., London. Seed of *Clematis Meyeniana*. Sown.
- HANBURY, Lady, Ventimiglia, Italy. Collection of seeds. Plants raised for distribution.
- HANCOCK, T., Mansfield. Pea 'Hancock's Exhibition' (see p. 516).
- HARRISON, Messrs., Leicester. Broad Bean 'John Harrison' (see p. 160); Beet (see p. 488); Peas (see pp. 498, 516); Lettuce (included in trial).
- HENRY, Dr., A., Dublin. Seeds of *Pinus canariensis* and *Fraxinus nigra*. Sown.
- HILL, A. W., Kew. Seed of Cotton. Plants raised.
- HOGG & ROBERTSON, Messrs., Dublin. Potato 'Champion II.'
- HOLDER & TILT, Messrs., Birmingham. Broad Bean 'Erdington Gem' (see p. 160).
- HOLMES, E. M., Sevenoaks. Seed of *Atropa Mandragora*. Sown in oak wood.
- HOLMES, W. G., Tain. Pea 'Glory of Ross' (see p. 516); Potatoes (see p. 135).
- HURST, Messrs., London. *Eschscholzia* 'Mikado' (see p. 167); Haricot Beans; Peas (see pp. 498, 516); Lettuce; Beet (see p. 488).
- INGWERSEN, W. E. T., Croydon. Collection of plants for rock garden.
- JENKINS, E. H., Surbiton. *Anemone nemorosa* *Allenii*. Planted in garden.
- KEEBLE, Dr., C.B.E., Food Production Department. Seed of Prickly Spinach; Madagascar Butter Beans; Nenima long Radish. For trial and experimental purposes.
- KELWAY, Messrs., Langport. Peas (see pp. 498, 516); Beet (see p. 488).
- KENT & BRYDON, Messrs., Darlington. Beet 'Brydon's Exhibition' (p. 488) Lettuce 'McHattie's Giant.' Included in trials.
- KITTLE, J. J., Corfe Mullen. Raspberry 'Lloyd George.' Included in trial.
- KEW, ROYAL BOTANIC GARDENS. Collection of seeds (plants raised for distribution); seed of Bromeliad; *Clematis Stanleyi*. Sown.
- KING, Messrs. E. W., Coggeshall. Beet (see p. 488); Onions (see p. 147).
- LANSDALE, F., West Moors. Poppies (see p. 483).
- LAXTON, Messrs., Bedford. Early Dwarf Pea 152/A.
- LODER, G. W. E., Ardingley. Collection of shrubs. Planted in garden. Seeds of *Berberis concinna*, *B. virescens*, and *Magnolia parviflora*. Sown.
- LONGSTAFF, Mrs., Wimbledon. Mango plant. Growing on.
- LOW, Messrs. S., Bush Hill Park. *Leonotis Leonurus* (growing on); Carnations.
- LOWNDES, Mrs. G. R., Ringwood. Seeds from India. Sown.
- LUCKHAM, Miss K. E., Cheltenham. Seed of *Gentiana autumnale*. Sown.
- MALISTER, A. W., Dumfries. Potato 'Rob Roy' (see p. 135).
- MACGREGOR, D., Shanghai, China. Grafts of dwarf Peach from N. China. Failed to grow.
- McLENNAN, Mrs., Blanford. Beet 'Bell's Deep Blood Red' (see p. 488).
- MARSHALL, Rev. E. S., Taunton. Forms of *Saxifraga rosacea*. Planted in collection.
- MASTERMAN, L., Tasmania. Seeds of Parsley, Delphinium, and Hollyhock. Sown.
- MATHESON, T., Morpeth. Beet 'Matheson's Selected Northumberland Red.' Included in trial.
- MOTT, H. C., Albury, New South Wales. Seed of Sweet Pea.
- MOWATT, Mrs., Grayshott. Ceterwayo Potatoes. Planted in garden (cropped badly).
- NORTH-ROW, W., Chelsea. Seeds of Locust Beans and Carlin Peas. Sown.

- NORCUTT, R. C., Woodbridge. Beet (see p. 488); Potato 'Keen's Seedling' (see p. 135); cuttings of *Cistus* &c. (growing on).
- NUTTING, Messrs., London. Bean 'Invicta Longpod' (see p. 160); Peas (see pp. 498, 516); Beet (see p. 488); Onions (see pp. 147, 156); Leeks; Lettuce (included in trial).
- PHILBRICK, Miss, Halstead. Seed of white creeper. Sown.
- PITT, W., Brighton. Patent Dibber. For trial.
- PONTING, C., Great Missenden. Potato 'Top Hole.'
- REUSS, R. L., Woking. Collection of seeds. Sown.
- ROBERTS, J., Tullamore. 'Cooper's Black' Grape. Growing on.
- ROSENFHEIM, P., East Molesey. Seeds and plants for rock garden.
- ROSS OF BLADENSBURG, Sir J., K.C.B., Rostrevor. Collection of seeds. Plants raised for distribution.
- SALYER & STOKES, Messrs., Smithfield. Sample of wood tar.
- SANDS, W. E., Hillsborough. Potatoes (see p. 135).
- SIENA, UNIVERSITY BOTANIC GARDEN, Italy. Collection of seeds. Plants raised for distribution.
- SIMPSON, Messrs., Birmingham. Stocks; Shirley Poppy (see p. 483); Shallots (see p. 146); Peas (see p. 408, 416); Onions (see pp. 147, 156); Beet (see p. 488); Broad Beans (see p. 160).
- SOMERSET, A., Worthing. Elms, Walnuts, and Willows. Planted in garden.
- SOMERVILLE, Prof., Oxford. *Scleranthus biflorus*. Growing on.
- SPENCER, L. J., London. White Runner Beans. For trial 1918.
- STARK, Messrs., Great Ryburgh. Poppies (see p. 483).
- STEPHENS, M., Peaslaugh. Seed of Magnolia. Sown.
- STOKES, Lady, Ockham. *Primula japonica* hybrid. Planted in garden.
- STOKES, Messrs., Trowbridge. Raspberries. Included in trial. Shallot 'Stokes' 'Selected Large Red' (see p. 146).
- SUTTON, Messrs., Reading. Wart-Resistant Potatoes (see p. 135); Beet (see p. 488); Broad Beans (see p. 160); Peas (see pp. 498, 516); Onions (see pp. 147, 156); Maize (grown in experimental trial); Lettuce, Beet (included in autumn sown trials).
- SYDENHAM, Messrs., Birmingham. Peas (see pp. 498, 516); Broad Bean 'Eclipse Longpod' (see p. 160); Stocks; Eschscholzas; Poppies (see p. 483); Leek 'The Lyon'; Beets (see p. 488); Lettuce.
- TAYLOR, Mrs., Pyrford. Books for Library.
- THRUPT, A. C., Kamloops, British Columbia. Seeds of 'Johnny Jump-up' and Red Cedar. Sown.
- TOOGOOD, Messrs., Southampton. Beet and Lettuce. Included in trials.
- TURVEY, R., Cranleigh. Orchids. Added to collection.
- UNWIN, Miss, Farnham. *Cnium*, *Acidanthera*, and other roots from Nigeria. Growing on.
- UPPSALA BOTANIC GARDEN, Sweden. Collection of seeds. Plants raised for distribution.
- VEITCH, Messrs., Exeter. Poppies (see p. 483); Eschscholzas; Onions (see pp. 147, 156); Stocks; Shallots (see p. 146); Peas (see pp. 498, 516); Broad Beans (see p. 160); Leeks; Beet (see p. 488); Lettuce (included in trial); Potatoes (see p. 135).
- VEITCH, Sir HARRY, V.M.H., London. Vols. 2 and 3 'Plantæ Wilsonianæ' and pamphlets, 'Orchid Review' 1916. Deposited in Wisley Library.
- VILMORIN, Messrs., Paris. Haricot Beans.
- VOSS, Messrs., Millwall. Voster, Creol, and Catterscab.
- WATKINS & SIMPSON, Messrs., London. Stocks; Eschscholzas.
- WEBB, Messrs., Stourbridge. Lettuce (included in trial); Beet (included in trial).
- WEST, W., Holt Hatch. Grape 'Princess of Wales.' Growing on.
- WILKS, Rev. W., V.M.H., Shirley. Seeds of *Lychnis Arkwrightii* (plants raised), *Anemone alpina sulphurea*, *Euonymus latifolius*. Sown. Shirley Poppy and *Verbascum Lychnites* for distribution to Fellows.
- WILSON, Dr. J. H., St. Andrews. Seeds of *Rubus*.
- WOODWARD, Mrs., Bewdley. Seeds of *Pasania Woodwardii*. Sown.
- YOKOHAMA NURSERY Co., London. Seed of Prickly Spinach.

COMMONPLACE NOTE.

PRESERVING APPLES AND PLUMS.

By T. H. DIPNALL, F.R.H.S.

FELLOWS of the R.H.S. may be interested to know the following methods of preserving Apples and Plums respectively, one of which I have found successful on personal trial, and the other I learnt from a neighbour, whose statements I have every reason to believe are quite trustworthy, and who said he had seen and tried fruit preserved in this way. The latter plan I only heard of the other day (in April), but when the plum season comes round again I hope to test it for myself; even if it were a failure, it would only entail the loss of a pound or two of fruit, for one would not experiment with a large quantity at first.

Anyone who has Apple trees growing in grass has found in February and March quite sound fruit hidden among the herbage, unhurt by the weather and quite firm and free from shrivelling. Having heard at different times that Apples would keep well if clamped like potatoes, and with the knowledge that they often kept well lying perdu in the orchard, I determined to try clamping them myself. The variety experimented with was 'D'Arcy Spice Pippin,' one of the best flavoured of late dessert apples, but one which I have never succeeded in keeping much later than the end of February in the apple cellar without shrivelling. Last autumn there was a very heavy crop of these, and out of a heap put on a loft for sale early in the New Year I had a bushel and a half of sound, firm fruit picked out and a small clamp made of them in the garden at the beginning of January. Various circumstances prevented me from having the clamp made earlier in the season, otherwise I should have done so about the end of November, as soon as the fruit had finished sweating. A bed of clean wheat straw was made on the soil and the fruit heaped up on this, then the heap was covered with straw and earthed over in exactly the same way as one clamps potatoes or mangolds. They were then left untouched till about ten days after Easter, when I opened the clamp to try them. Out of about half a peck of fruit taken out up to the present, four or five, which were evidently specked when clamped, had begun to go bad. The rest were perfectly firm and sound and the flesh was softer and juicier and, if anything, sweeter than in the case of apples kept exposed to the air, while in flavour they are quite equal to any I have tasted. The skins, apart from a little earth which had sifted through the straw on to them, were clean and smooth, but slightly damp and sweaty and wanted washing or rubbing with a cloth before use. I have been told that the skins

of clamped Apples have an unpleasant flavour, but I have not tried them, as all apple skins are too tough for my teeth nowadays. Next autumn, as the first trial has turned out so well, I mean, if the fruit crop fulfils the present promise of the blossom, to experiment with other varieties. If clamping will keep 'Cox's Orange Pippin' firm and juicy till April, as I believe it would, it is a method well worth adopting with choice fruit, at any rate when there is a big crop.

The system of preserving Plums which, as I have said, I have not yet been able to try, is a variation of the common practice of bottling and a very simple one, having the usual object of excluding all air from the fruit. In this case, however, heat is not used as a sterilizing agent, it is a cold-water method. All the apparatus required is screw-stoppered bottles, a vessel deeper than the bottles to stand them in, and a plentiful supply of cold water. Having prepared the bottles in the usual way, seeing that they are quite dry and clean, fill them with fruit from which the bloom has been carefully wiped, taking care to use only fruit which is quite sound and free from bruises. Then fill the bottles to the brim with cold hard water, and, placing them in the deeper vessel under the tap or pump, let the water run into this, or keep on pumping into it till the bottles are absolutely free from air bubbles. As soon as this happens, screw the lids down tight on the bottles *under water*, then take the bottles out and store them for use when required. That is all, and, if effective, it is certainly a very easy and inexpensive method. Whether other fruits would keep well preserved in this way I do not know, but one would think that it might be adopted for such things as green gooseberries and tomatoes at least. Of course the fruit would need more cooking when used, as it would be quite raw in the bottles and not partially cooked, as is generally the case.

BOOK REVIEWS.

"Rhododendrons: in which is set forth an Account of all Species of the Genus Rhododendron (including Azaleas) and the various Hybrids." By J. G. Millais. La. 4to. xi + 268 pp. Plates. (Longmans, Green, London, 1917.) £8 8s. net.

This is a large book; but not too large. Its pages measure 15½ inches in height by 12 inches in width, but the plates require all of this if justice is to be done to the noble proportions of the flowers they are to depict. It is a heavy book, for it weighs 10½ lb.; but this is no detriment, for the library table must needs be called into requisition when it is being used. It is conceived in an ample spirit; but not too ample when one remembers the tremendous range of forms which it must survey. It is a costly book; but not too costly if worthy plates are to be included, and paper and type, extent and style are to be given, as they are, fitting to the great genus it deals with. Its subject is a great one; the number of species in the genus is enormous, and known forms are continually being added to as Chinese exploration extends; they are great in beauty for the most part, from the heath-covering forms of the Tibetan uplands to the giants of the Sikkim Himalaya, and the Azaleas of the North American flora; and their value in the English garden is great too, for some are hardy all over the British Isles, others at home in the temperate house, and others in warmer quarters, while the mild south-west gives hosts congenial homes. It only just misses to be a great book, and this because it betrays here and there just a trace of haste.

It is somewhat strange that there are so few popular books on Rhododendrons, next to the Rose probably the most generally useful genus of garden shrubs. The reason, perhaps, is that most of them require ample quarters to display their beauty. At the same time it is probable that if such popular literature were available, the cultivation of many of those forms known at present only in the gardens of the few would become more wide-spread. The range of season covered by one or other—*Rhododendron arboreum* in November to *R. maximum* in July, the range of colour from yellow and white to the nearly blue of *R. intricatum*, and the range of size from the pigmies through those of medium size to the giants of the race towering many times the height of a man, and their varying degrees of hardiness combine to furnish subjects for all situations where lime is not. The difficulties which surround the cultivation of some make them beloved of the amateur, while the rich reward in beauty that so often follows efforts to obtain new forms gives them value in the eyes of the hybridist. Who will not bless Mr. Mangles' memory when he sees Rhododendron

'Loder's White,' one of the choicest of Griffithianum's numerous progeny? and who would not be happy to raise a counterpart of it? Sir E. Loder's magnificent *R. × Loderi*, the popular 'Pink Pearl,' as to the origin of which there seems some doubt, and in the cultivation of which there are such frequent errors, and many another, spur the seed-raiser on to hope for still further beauties in store.

The plates are, of course, a feature of the book. They are of three types: collotype plates, which are magnificent, giving as well as black and white can give the values and texture of the superb plants they represent; half-tone plates, which too are excellent, representing in some cases the plants growing in their native habitats by means of the fine photographs taken by Mr. G. Forrest, with which the Fellows of our Society will be familiar; and coloured plates from paintings representing plantings of Rhododendrons and also portraits of individual flower clusters. A coloured plate of such a grouping in the garden as Rhododendrons can give must lose something in its reproduction, and though these are excellent, yet that glory of high June which thoughts of Azaleas and Rhododendrons at the zenith of their flowering arouse is somehow missed, perhaps because the gloss or the grey of the rhododendron foliage is not easy to portray, or because the atmosphere of a June day cannot be expressed in a coloured plate. Of them all, perhaps, Thorburn's "Knaphill Nursery in June" pleases us best. Some of the individual trusses shown are good, but all would, we think, have been better for the elimination of the background which they have been given—too much like the heavy leaden hues of the out-of-focus parts of a colour-photograph. We need another Redouté; but perhaps a good deal might be learned by a patient study of that master's methods and a great forward step achieved in the faithful and artistic picturing of flowers even yet.

The text is the work, so far as the first part is concerned, of Mr. J. G. Millais, and his previous works on birds and beasts have made his style and powers familiar to every lover of fine books. He gracefully acknowledges the help he has had from Sir Edmund Loder, Messrs. P. D. and J. C. Williams, and Prof. Bayley Balfour, who has done so much of late to clear up difficult questions on the classification of the genus as new material from the Himalaya and from China has become available, and to Mr. J. Hutchinson of Kew. The last-named gentleman has drawn up a key to the identification of the cultivated species of the genus. Such a key should be of great assistance in discovering the name of an unknown form (so long as it has been described), and it forms a useful introduction to the alphabetical arrangement of technical descriptions of species (many of them from material supplied by the Edinburgh Botanic Garden), which follows along with various notes of historical and cultural value. These descriptions comprise more than half the letter-press, and for the first time bring together descriptions of the species and hybrids comprising the genus.

The earlier chapters treat of the Love of Gardening and Gardens, the General Distribution of the Species, Chinese Rhododendrons, Hybrid

Rhododendrons with a list of hybrids, Cultivation, Rhododendrons for every month, and Gardens where Rhododendrons are an especial feature.

"The Book of the Peony." By Mrs. Edward Harding. 8vo. 259 pp. (Lippincott, London, 1917.) 25s. net.

The first book devoted to the *Pæony* hales from America, where the cultivation of these glorious flowers of early summer has been taken up with an enthusiasm almost unknown on this side of the Atlantic, much as many of us appreciate their beauty and value in the garden.

The text is both interesting and valuable; the plates, both coloured (twenty in number) and black and white, are excellent; the clear type, the ample margins, the rather old-fashioned paper, the uncut edges, all make a book the book-lover may desire, and the garden-lover wish to purchase for reference as well as for merely reading.

What the French and English growers began to develop and carried to a great pitch, the American nurserymen have continued; and where America has drawn much from our own country in the past, we may hope to be repaid by further beauties in the future, though we need not, with the incoming of new species of *Pæonia* from China and elsewhere, rest content with our laurels.

The Tree *Pæonies* have not yet come to their own in England. Here and there we hear of wonderful successes with them. That remarkable plant in Mr. E. Taylor's garden in Norfolk, which, when eighty years of age and fifteen feet in diameter, bore 400 flowers, is enough to show what *Pæonia Moutan* at its best is capable of, and to make us wish to emulate the success there achieved. Perhaps the stock leaves something to be desired, for Tree *Pæonies* as propagated in France are nearly always on *P. albiflora* stocks, and Japanese plants are grafted on wild *P. Moutan*. It may be, perhaps, that *P. lutea* will furnish a better stock, or *P. Delavayi*; but, in any case, both these at present rather uncommon plants are well worth a place in our gardens. *P. lutea* has, as our readers know, produced more than one good hybrid with *P. Moutan*, none better so far than 'La Lorraine,' raised by M. Lemoine of Nancy, and exhibited in 1912.

Useful keys, descriptions of species and of the varieties best known in cultivation, combine to make this an excellent monograph upon a very fine genus.

"Cotton and Other Vegetable Fibres." By Ernest Goulding, D.Sc., F.I.C., with a preface by Wyndham R. Dunstan, C.M.G., LL.D., F.R.S., Director of the Imperial Institute. Imperial Institute series of Handbooks to the Commercial Resources of the Tropics. 8vo. 231 pp. (John Murray, London, 1917.) Price 6s. net.

Probably few persons not directly concerned in the trade are aware of the number of fibres of vegetable origin that enter into commerce, and perhaps still fewer are acquainted with the botanical and geographical origin of the supplies that reach this country. This may to some extent be accounted for by the fact that hitherto the literature on this subject has been scattered through technical journals and scientific works that have not been readily available to

the general reader. In this latest addition to the Imperial Institute Series of Handbooks to the Commercial Resources of the Tropics, Dr. Goulding has brought together in a readable form and in small compass an accurate account of the sources, both botanical and geographical, of all the fibres of commerce, and has described their production and preparation for export and, where possible, has given statistical data to indicate their importance as articles of trade. To describe the utilization of fibres fully would have needed a much larger volume than the present, but sufficient has been said with regard to the chief uses to which each fibre is applied to enable the reader to gauge its present and future importance in commerce.

The more important fibres, such as jute and cotton, are of tropical and sub-tropical origin, but there are others of great utility, such as flax and hemp, that might be produced in this country. Prior to the outbreak of war Russia and Belgium supplied the bulk of the world's flax, and Russia the greater part of the hemp; but in view of the present condition of these two countries some years must elapse before they can again supply the world's demand for these fibres. In view of this it would appear desirable for agriculturists in this country to devote some attention to these crops, both in their own interests and in the interests of those home industries that depend on flax and hemp as raw materials for their manufactures. In the preface which he contributes to this book, Professor Dunstan emphasizes the importance of increasing the production of fibres within the Empire, and in this connexion it is to be hoped that all horticulturists and agriculturists who migrate overseas after the war will provide themselves with a copy of this book as a reminder of what it may be possible for them to accomplish in the way of fibre production.

The book is well printed and free from errors; it contains twelve plates illustrating the more important fibres, but it is to be hoped that future editions will include illustrations of little-known fibre-yielding plants, if these can be supplied without unduly increasing the present moderate cost of the book.

"The Chrysanthemum." By C. Harman Payne. 8vo. (Reprinted from the Transactions of the Japan Society of London, vol. xv.)

This artistic and neatly printed pamphlet contains, in a condensed form, the substance of an afternoon's chat on some historical and literary aspects of the Chrysanthemum. The occasion was the opening of the winter session of 1916 of the Japan Society by Sir Albert Rollit, at whose invitation Mr. Harman Payne discoursed upon the subject, illustrating his remarks by a large number of lantern slides, some of which had been specially prepared for the meeting.

Of these slides twenty-four are beautifully reproduced in collotype in the pamphlet. They represent some of the first introductions into this country, from China, a century or so ago; one or two views of Chrysanthemums in the garden of the Emperor of Japan, and quite a number of reproductions of huge single, very quaint, specimen blooms of the Kiku, as grown in Japan.

The text contains references to the Li-ki of Confucius, the first Oriental author known to have mentioned the Chrysanthemum, to T'ao-yuan-Ming, a famous cultivator of the flower in the fifth century A.D., and to others down to Joseph Hardy Neesima, the young Christian Japanese through whose instrumentality the famous 'Mrs. Stephens' Hardy Chrysanthemum, the first of the Hairy Section, was introduced into Western gardens. But a very small edition has been printed.

"Science and the Nation." Ed. by A. C. Seward, with an Introduction by the Rt. Hon. Lord Moulton. 8vo., xxii + 328 pp. (University Press, Cambridge, 1917.) 5s. net.

This symposium is an attempt to establish in the minds of English readers the value of research in pure science, not only for its own sake, but also for the direct influence such research has upon industrial progress. The theme is outlined in an introduction by Lord Moulton, and sustained by Professor Pope (Chemistry), Professor Bragg (Physics), W. Rosenhain (Metallurgy), Professor Hobson (Mathematics), F. W. Keeble (Botany), W. Dawson (Forestry), Professor Biffen (Plant-breeding), T. B. Wood (Agriculture), H. H. Thomas (Geology), Professor F. G. Hopkins (Medicine), Professor Nuttall (Disease), G. S. Graham-Smith (Flies and Disease), W. H. R. Rivers (Government of Subject Races). All the essays are valuable, and nearly all the writers have realized the truth of the quotation from Huxley which backs the title-page, "What people call Applied Science is nothing but the application of Pure Science to particular classes of problems," but in one or two cases it does not seem to be realized that a worker in pure science cannot always see the way in which his discoveries can be applied

to industrial use, even when those discoveries have in the end far-reaching results. Too often, the thinly-veiled feeling of contempt or pity which is felt by the "practical" man towards one whom he thinks stalks through life with his head in the clouds or buried in his apparatus is shared by the "pure science" man—though not often by those at the head of their line on either side—and until each is willing to accept the help of the other the utilization of scientific discoveries for the betterment of the human race and for the increase of industrial prosperity cannot be realized to the fullest extent. The essays in this book should do not a little to bring about that desirable *rapprochement*.

Like all the publications which emanate from the Cambridge University Press this lacks nothing in make up, type and paper being excellent in every way, and the occurrence of so objectionable a form as "preventative" on p. 291 therefore surprises us the more.

"Productive Plant Husbandry." By K. C. Davis. 8vo., xvi + 462 pp. (Lippincott, London.) 7s. 6d. net.

Judging by the number of books published dealing with agricultural and horticultural instruction in school and colleges, America has realized the importance of systematic teaching in rural subjects in a way that is unknown in England. It may well be that agriculture may be taught in such a way as to be quite useless to the pupil either as a training for the mind or for the practical treatment of soil and crops, on the other hand a carefully planned course of science and practice may be as educational as any subject of the schools and of the greatest practical value.

The present volume deals with the growth and utilization of plants, and illustrates in an excellent fashion the kind of course likely to be useful.

The book would not be entirely suitable for the English student, for the material used for illustration, common in America, is not always to be had here, but for the teacher the whole volume is replete with suggestion and much of the actual work proposed could be used with advantage in courses here. We have great pleasure in recommending the book to all teachers who wish to give a rural bias to their work, and to all students who are seeking a plain statement of the methods of plant production and the reasons for them.

"How to Collect and Dry Flowering Plants and Ferns." By H. S. Thompson. F.L.S. 56 pp. 8vo. (Routledge, London, 1917.) Paper covers, 7d. net.

One is often asked for a book giving directions for the preservation of plants for future study. Such directions are often printed, mainly as part of larger volumes; but we have here a handy little book containing all the information likely to be required, and written by one with a long experience of his subject. We can very heartily recommend it to all students and others who seek for information and plain readable directions upon the subject dealt with.

"Manuring for Higher Crop Production." By E. J. Russell, D.Sc., F.R.S. Ed. 2. viii + 94 pp. 8vo. (University Press, Cambridge, 1917.) 3s. 6d. net.

"Soil Conditions and Plant Growth." By E. J. Russell, D.Sc., F.R.S. Ed. 3. viii + 243 pp. 8vo. (Longmans, Green, London, 1917.) 5s. net.

So short a time has elapsed since the first edition of the first of these capital books was published and reviewed in this JOURNAL that we need only draw attention to the new edition. Additions mainly dealing with the breaking up of grass land have been made, and the whole forms a very useful guide to the treatment of land for farm crops.

A third edition of the second volume also calls for little remark except that it, too, contains several alterations in the text, and is brought up to date by the inclusion of a chapter on colloids so far as the soil is concerned with them.

The book is essentially a monograph on the soil, and a review of the present position of soil science.

"Grow Your Own Vegetables." By S. C. Johnson. 199 pp. 8vo. (Unwin, London, 1918.) 6s. net.

In these days when allotments have sprung up in such vast numbers everywhere, and are likely still to extend in all parts of the kingdom, this is a most welcome book, as there are so many problems that puzzle the allotment holder that he will be glad to have the advice so fully afforded and so clearly explained. The numerous diagrams are a great aid, and will be much appreciated. It is a book we can confidently recommend.

"The Small Garden." By Mary Hampden. 294 pp. 8vo. (Jenkins, London, 1918.) 5s. net.

The authoress has written a very interesting book, containing a mass of useful information and advice that will be valuable for possessors of small gardens; but there are a few things we do not agree with. We cannot endorse what she says on p. 158, as follows: "With all fruit trees that bear in early summer, on walls, there may be light-growing late summer-blooming climbers associated, such as *Cobaea scandens*, Canary creeper, and *Convolvulus major* among the annuals; or the permanent Jackmani Clematis can be cut down to the ground nearly in March, and will come on slowly, attaining height and thickness of growth too late to injure the fruit trees, yet in time to give a splendid blossom before winter." Fruit trees on walls should have the first consideration, and to introduce any of the plants named into or over the trees may have a charming effect, but it will be at the expense of the trees: the young wood is unripened; fruit buds, if any, are weak and poor, or killed outright, and in one or two years such trees are worthless, and to all thinking of such a plan to improve the appearance of their garden, we say "Don't." Again, we think the authoress must be residing in a warm sheltered place, as some of the plants she mentions are tender in the Midlands. Apart from this grumble, we have nothing but praise for the book, which is well printed, contains good plans, embraces a great number of subjects, and well indexed.

"Insect Enemies of the Allotment Holder." By Professor F. V. Theobald, M.A., F.E.S., F.R.H.S. 59 pp. 8vo. (The Author, Wye, Kent, 1918.) Paper covers, 1s. 6d. net.

Of all the worries to which the grower of vegetables on allotments is subject, none looms so large in his eyes, as a rule, as those due to insect attacks. In this little book we have a safe and comprehensive guide to their treatment. Wireworms, Flea Beetles, Pea and Bean Weevils, Cockchafer, Cabbage Gall Weevils, Cabbage White Butterflies, Surface Caterpillars, Winter and Codling Moths, Onion, Carrot, Celery, Beet, and Cabbage Root Flies, Leather Jackets, Pear Midge, Currant and Gooseberry Sawfly, Apple Sawfly, Aphides, Scale insects, White Fly, Bigbud, Red Spider, Millipedes, Woodlice are all dealt with, and the beneficial insects, Ladybirds, &c., are also referred to. Appropriate methods of control are given where they exist, and useful recipes for the making of insecticides conclude a very handy and reliable little book.

"Strawberry Growing." By S. W. Fletcher. 8vo. 325 pp. (Macmillan, New York, 1917.) 7s. 6d. net.

This volume is an addition to the well-known Rural Science Series, and deals in great detail with the cultivation and marketing of the Strawberry in the United States. While the bulk of the information is mainly applicable to transatlantic conditions, the progressive grower will pick up many useful hints as to packing and marketing.

From the scientific point of view the chapter on Pollination is interesting as showing that unisexual varieties are still grown in the States. It is curious that these types should persist when they have for so long been discarded in Europe. It is noticeable that varieties of British origin are little grown; we notice only 'Royal Sovereign' in the list, and that is among those of less promise. The writer's experience of American varieties has been one of unbroken failure, and a curious problem in adaptation arises which tempts to further study.

The author may be congratulated on the production of a useful work which should stimulate the economic cultivation of the Strawberry in his own and other countries.

"Rational Fruit Culture." By H. C. Davidson. 8vo. 127 pp. (Garden Life Press, London, 1917.) 2s. 6d. net.

We must confess to a certain prejudice against the use of such a question-begging word as "rational," whether in matters of dress, ethics, or Fruit Culture. The author justifies his work by a very true criticism of his predecessors' dogmatic methods, his own being to give reasons for all that he advises. When, however, one turns the pages of his work, the bright hopes that we always cherish on taking up a new book rapidly disappear, and one is tempted to think no reason at all is better than a wrong one. Space will not permit a detailed examination of the author's extraordinary blend of fact and fiction, but one or two

examples will serve as a taste of his quality. On page 32 we learn that roots should be trimmed with a knife where injured or broken, if not they will give rise to suckers. It is then carefully explained that these arise solely from the callus formed, the implication being that no callus arises from the trimmed root. Page 2 contains a passage which is worthy of preservation. "Failure to flower may be due to some condition which is merely temporary, such as unfavourable weather, or to one which is more persistent, such as extreme youth." One is reluctant to condemn altogether a work which has certain good points, but when we are shown a picture of a whip graft which is not a whip graft at all, and a Strawberry runner is shown layered in a pot which stands above the ground, the author saying that they are thus rather apt to get dry, and therefore runners laid in the soil itself are better, we can but conclude that the writer is better acquainted with the use of the scissors than the spade.

"The Pruning Manual." By L. H. Bailey. 18th edition. 8vo. 497 pp. (Macmillan, New York, 1916.) 8s. 6d. net.

When a book on Pruning has attained its eighteenth edition and extends itself over 400 pages it presents a solid fact before which the most critical of reviewers must pause.

Prof. Bailey's work is well known on this side of the Atlantic, and the present volume is without doubt the most detailed we have on the subject in English. One defect he shares in common with all writers in our language is the lack of stable nomenclature for various parts of fruit trees. We have recognized the bud, fruit bud, and shoot, but beyond this our vocabulary has not yet extended. When we contrast the greater precision of French writers by the recognition of "dard," "brindille," "coursion," &c., it seems high time that we should either translate or naturalize these terms.

We note that Prof. Bailey has left the Lorette system severely alone, and in this perhaps he is wise. Should it raise a bitter polemic in his country comparable with that engendered in France, it is manifestly a sage decision which postpones its discussion until more peaceful days.

Though dealing mainly with fruit trees, there are chapters on Roses and Flowering Tree pruning, and the section on Vine training may be noticed as exceptionally full.

"Roses, and How to Grow Them." By Edwin Beckett. 8vo. 126 pp. (Pearson, London, 1918.) Price 2s. 6d. net.

Mr. Beckett has acquired much fame as a grower of vegetables, but after carefully reading his book on Roses, we have come to the conclusion that he is equally proficient in the cultivation of the Queen of Flowers, and although the number of books on Roses is so great, there is plenty of room for this one, as it contains just what is wanted by the would-be grower of Roses for home use. The number who grow for exhibition are few compared with those who require Roses for their own pleasure, and we have no hesitation in strongly recommending this well-printed and exceedingly practical handy little volume.

"Forestry Work." By W. H. Whellens. 8vo. 236 pp. (Unwin, London, 1918.) 8s. 6d. net.

The author's wide experience of forestry on some of the best-wooded estates in this country renders him well suited for writing on the operations that require to be undertaken in connexion with afforestation. It is, however, more a student's book than one for the advanced forester or manager of woodlands, though in the 232 pages a great amount of useful information has been got together. Many of the details given are rarely obtainable in books of the kind, and as the author has a clear way of imparting his knowledge to others, the information contained in some chapters will be all the more valued.

Of the nine chapters into which the book is divided, some of the most important at the present time, when foreign tree seeds and seedling plants are difficult to procure, are the laying out and stocking of the nursery ground; transplanting; formation and tending the plantations; regular and systematic thinning; and final felling and disposing of the crop. Fencing, road and path making, pruning, barking oak, woodland drainage, and a short account of some of the most injurious of forest insects are all useful chapters. What is the most profitable age at which to sell a tree, and the rotations which have proved most profitable are helpful matter,

Several useful tables are given, and the vexed question of measuring timber is touched upon. It would have been useful had the author given some notes on trees and soil, hillside and seaside planting, trees for economic planting, and the formation and tending of game coverts. Our experience with reference to the larch disease or "canker" is that mixed hard-wooded sections are just as badly attacked as are the pure woodlands or where only larch is used. The book, which is rather poorly illustrated, should be found of value to the young forester in particular, though even those further advanced in that profession will find much of interest in its pages.

"Seeding and Planting." A Manual for the Guidance of Forestry Students, Foresters, Nurserymen, Forest Owners, and Farmers. By James W. Toumey. 8vo. 455 pp. (Wiley, New York; Chapman & Hall, London, 1916.) 16s. 6d. net.

This is by far the most practical and exhaustive work that has yet been published on that most important of forestry operations—collecting and harvesting tree seeds and raising the seedling plants. Every detail, from the choice of trees from which the best seeds may be collected, through all the intricacies of storing, preparing, and sowing the seeds, attending to the seed beds, transplanting, and final planting out, are minutely dealt with, and in such a way that one in reading the various chapters is impressed by the genuineness of the information that is so well and pleasantly imparted. To the casual observer the raising of seedling forest trees may appear a simple matter, but such, in reality, is far from the case; the responsibilities attending choice of seeds, extraction of these from the cones or other seed vessel, storing in such a way that heating or rotting is avoided, preparation of suitable seed beds, best methods of sowing and preserving the seeds from vermin, attending to the young seedlings, and keeping them free from insect and fungus pests, transplanting in order that fibrous roots and bushy plants may be the outcome, and finally lifting, "sheughing," and transplanting to their permanent positions, being only a part of the many operations that require skilful management at the hands of the nurseryman. The chapter on "Establishing Forests by Direct Seeding," which, by the way, has never proved a success in this country, is common-sense and lucid, and may well be successfully carried out in the natural forest, while the notes on tree-planting cannot be too widely appreciated, particularly with reference to too deep planting, bending, and crowding the roots and necessity for firming the soil about the roots. But altogether the book, which extends to 445 pages, with 140 well-executed illustrations, is one of particular value to the student of forestry, and particularly at the present time, when a dearth of both seeds and seedling plants has been occasioned by the war.

"Canning and Bottling: Simple Methods of Preserving Fruit and Vegetables." By Dr. Helen P. Goodrich. 8vo. x + 70 pp. (Longmans, Green, London, 1918.) Stiff covers, 2s.

The author compares the value of tins with bottles for the preserving of fruits and vegetables, to the advantage of the former. She gives directions for the preserving of practically all the common fruits and vegetables capable of preservation in bottles, and in the second part of the book the scientific basis of preserving. If her directions are followed there can be no doubt that fruit and vegetable preserving will be successfully carried out; but the author has, we fear, not acquired the faculty of writing in language to be "understood of the people." We tried the book on (1) a well-read mistress of a household, who protested difficulty in following essential details, and on (2) an intelligent maid, who said she could make little of it, and this is a pity, for so good a book loses most of its value if those for whom it is intended fail in their understanding of it.

"The Book of the School Garden." By C. F. Lawrance. 8vo. xii + 231 pp. (Evans Bros., London, n.d. [1918].) 3s. 6d. net.

This is one of the best of the books of its class which we have come across. It deals with gardening in the school garden and in the allotment. While there are probably no absolutely new things in it, yet the writer has often broken away from the stereotyped method of dealing with his subject and given us a somewhat fresh statement of ideas, and this is just what is so often wanting in such books. Clear, concise, and reasoned directions for work to be done, amply illustrated in many cases by original figures and with an unusual and very useful chapter on home-made appliances, make a book we can cordially recommend. A few misprints may be easily corrected in the next edition, which we anticipate will soon be called for.

"Modern Propagation of Tree Fruits." By B. S. Brown, M.S. 8vo, xi + 174 pp. (Chapman & Hall, London, 1916.) 6s. net.

This is a technical handbook intended for the use of students and practitioners of tree fruit propagation. It is written from the American standpoint, and thus differs somewhat from the practice here; but the English nurseryman will not complain of that, for while his methods have been exceedingly successful in the past he is not averse from considering fresh ideas and adopting them if they will fit his aims. Nursery work on a very extensive scale is contemplated in the book as well as the orchard nursery run by the fruit-grower himself.

Various kinds of propagation suitable for different trees and different purposes are described, and though the work is not so full on this part of the subject as, e.g., Balter's "Grafting and Budding," the chapters on methods of marketing, the working of a nursery, and the like, add a good deal to the literature of nursery work.

"The Flower Garden and How to Work in it." By M. E. Stebbing. 8vo. pp. 174. (Jack, London, 1917.) 1s. 6d. net.

A well printed and fairly well illustrated work, containing a good deal of useful information for the amateur; but we do wish that all writers who advocate women working in gardens would advise them how to dress for such work. In the illustration showing women hoeing and staking and tying up they have long skirts on, and those who have had such attired people amongst choice flowers know the fearful mess they make, especially if the hems of their skirts get damp. The proverbial bull in a china shop would scarcely cause more havoc. We have nothing to say against women working in the flower garden but insist on the necessity for their dressing properly for the work.

"Jottings of a Gentleman Gardener." By E. T. Ellis. 8vo. 268 pp. (Reeve London, 1917.) 3s. 6d. net.

This is an excellent book, full of really good information on such subjects as Annuals, Biennials, Perennials, rock-gardens, roses, bulbs, soils and their management, propagation, manures, calendar of operations, &c., &c., all worthy of careful study. The weak portion of the work is the vegetable garden portion at the end of the book. Nothing is said about sowing seeds of vegetables in August on land from which crops have been cleared, such as beet, carrots, onions, &c. that have proved such a splendid addition in many gardens, particularly where the soil is well drained and open. Again, we think more should be said about raising Brussels sprouts, broccoli, borecole, savoys—all most valuable vegetables—and less said about Cardoons, Kohl-rabi, Couve Tronchuda, which are not the most useful things to grow. We disagree that beet will bleed if the roots are broken. We rarely find a root bleed or lose colour when injured or cut through.

"Food, Fruit, and Flowers." By Walter P. Wright. 8vo. 336 pp. (Dent, London, 1917.) 5s. net.

We cannot do better than quote some remarks of the author in his preface: "In anticipation of food scarcity and of a long period of national impoverishment after the war, it is desirable that our systems of gardening should be reviewed. Flower-gardening must be pursued in a more simple and economical spirit, and I have made it my business to show in these pages that a change can be made without causing any loss of beauty or interest, &c." Admirably has the author fulfilled his task in the well-written book before us, and it should be read by all who are anxious to make the most of every portion of their garden. We are not in entire accord with his selection of varieties of fruit to plant. Worcester Pearmain is a second-rate apple. Bramley's Seedling is too diffuse in its habit for a small garden, and Pitmaston Duchess is splendid in appearance, but there its good qualities end. However, tastes differ fortunately, and the book is really first-rate.

"Vegeculture." By Harry A. Day. 8vo. 152 pp. (Methuen, London, 1917.) 1s. 6d. net.

This is a particularly useful book to read and study now, when it is the duty of all of us to produce as much good food as possible, and it will be an excellent guide to the amateur and less experienced cultivator on what to grow and how to grow it. A good index completes the book.

"The Allotment Book." By Walter Brett. 8vo. 92 pp. (Pearson, London, 1917.) 1s. net.

A book that will appeal specially to allotment holders, as it will be of great assistance to them in the trials they will meet in cultivating their plots.

"The Potato Book." By J. C. Newsham, F.L.S. 8vo. 92 pp. (Pearson, London, 1917.) 1s. net.

As might be expected from such a well-known author, this handbook is full of sound and valuable information, and all who are interested in potato-growing would do well to read carefully what Mr. Newsham says.

"1,000 Gardening Hints." By H. H. Thomas. 8vo. 152 pp. (Cassell, London, 1917.) 1s. 3d. net.

A most useful compilation of excellent hints and recipes on gardening matters, some of which will be appreciated almost daily. A first-rate index is given.

"Rockeries: How to make and plant them." By H. H. Thomas, assisted by S. Arnott. 8vo. 142 pp. (Cassell, London, 1917.) 1s. 3d. net.

One of the best handbooks on rock gardens we have seen, and crammed from end to end with a mass of thoroughly sound, practical, well-written matter that will interest the reader immensely.

"Britain's Heritage of Science." By A. Schuster, F.R.S., and A. E. Shipley, F.R.S. 8vo. xv + 334 pp. (Constable, London, 1917.) 8s. 6d. net.

In perusing a German scientific work one cannot fail to be struck by the copious references given to other papers upon the same subject, and by the apparently remarkable part German and some other Continental scientific workers have taken in developing our knowledge of the particular matter dealt with. British work is often referred to very briefly in such books. Yet, without claiming more than is her just due, we may still claim that not a few of the greatest and most far-reaching conceptions of Nature have had their birth in this land of ours, and not a small part of the developments that have grown out of those conceptions have been due to the devoted and enlightening research of Britain's sons. Why should we, as we so often do, belittle the work of our own countrymen by too loudly belauding that of others? Theirs may be good, and so is ours. Let us not in proud humility stand aside when others make detrimental comparisons between Britain's share in the advancement of knowledge and the shares others have taken, but let us put this book into the hands of our youths to teach them what a heritage has been bequeathed to us by British workers in many fields. It will surely stimulate them to further pursuit of knowledge and awaken a pride in them of careful research.

"The Irish Allotment Book." By L. J. Humphrey. 8vo. 54 pp. and plan. (Kenny Press, Dublin [1918].) Paper covers, 7d.

There are so many useful books on allotment gardening as a result of the war conditions as to be almost bewildering. Fortunately most of them insist upon deep cultivation, liming, rational systems of manuring; and the choice of the most valuable crops is insisted upon to occupy the ground. They differ in matters of small details, which are, nevertheless, often important. One can find something one would wish altered in almost all of them, though the good points, as here, generally predominate, so that the book is extremely useful.

The present little book illustrates this. Double-digging can be done by making the second trench equal the first in width, but it can be done more easily by making the first trench six inches wider than the second. The firming of the ground before seed-sowing is a method heartily to be recommended in most soils, but there is no need, in fact there is some danger, in firming it again after the seeds are in. A loose covering on the surface above the seeds is to be preferred to a close one on all counts. A useful set of rules for Allotment Societies is given at the end of the book.

"Modern Fruit Growing." By W. P. Seabrook. 8vo. Pp. 172. (Lockwood Press, London, 1918.) 4s. 6d. net.

This is one of the most excellent up-to-date books on the subject it deals with that we have seen, but in the next edition we suggest that the title be altered to

"Modern Hardy Fruit Growing," as nothing is included about fruit cultivation under glass.

Now that hardy fruit cultivation is being developed more and more, and is likely to be still further increased in all suitable parts of the country, such a book as this will be of immense service to the grower, and will be a useful guide to him if he will study it carefully, and act on the practical advice so clearly given without any undue verbosity. The questions are often asked how much capital is required an acre to start, the price of the land, terms of tenure, and other very important matters of the same kind; the selection and preparation of the land, protection from ground game, planting, selection of varieties, stocks, methods of growing, spraying, grading, marketing, &c. &c., all of which need close attention to obtain success, and though the fruit-grower can follow no hard-and-fast rule, but must be guided by local circumstances to a great extent, he will find the author's practical suggestions of immense help in making up his mind what to do, and how to do it in the most economical and approved style. The whole book is so well written and so plain that every one can clearly grasp what is indicated, and we have no hesitation in strongly recommending it, not only to the intending grower for market, but also to the amateur who is anxious to make the most of his trees.

"Our Vegetable Plot." By S. Graveson. 8vo. 32 pp. (Headley, London [1918]). Paper covers, 7d. net.

"The Allotment Month by Month." By R. H. Crockford. 8vo. 28 pp. (Elliott, Stevens, & Co., 1918.) Paper covers, 7d. net.

The first of these is a record of a beginner's experience of a year's vegetable growing, the second a kind of calendar with recommendations as to varieties to grow and so on. We especially commend the advice as to thin sowing and early thinning of all vegetables, recommended time and again in the latter, but we fear three inches is too deep for the sowing of peas in many soils.

"Fruit Bottling and Preserving: Practical and Homely Recipes." By Mrs. Edwin Beckett. 31 pp. (Country Life, Ltd., London, 1918.) Paper covers, 9d. net.

We recommend this little book for its clear practical directions, which the beginner in fruit bottling will find lead to success if she follow them carefully and fully. Vegetables are not dealt with: they are much more troublesome than fruits to preserve so as to keep well, of good colour, and retaining all their flavour. Jams, jellies, cheeses, and the pulping of fruit are, however, treated of in two very short chapters, while a chapter on preserving fruit in cold water brings a very useful little book to a close.

"Plant Propagation: Greenhouse and Nursery Practice." By M. G. Kains. 8vo. xix + 322 pp. (Orange Judd Co., New York, 1916.) \$1.50.

This is a thoroughly up-to-date book upon the general methods of propagation, full of useful hints and methods for shortening processes in nursery work as well as of details of the operations of layering (layerage), making cuttings (cuttage), and grafting and budding (graftage). The words in parentheses are the titles of chapters in the book under review. Some of the methods described are applicable only in districts with very cold winters like the north-eastern States and Canada, but, allowing for this, the English nurseryman and student will find in this book a very useful and enlightening treatise on one of the most important phases of gardening. We especially commend the remarks upon the effect of grafting to those who long for plants upon their own roots, and make didactic statements as to the peculiar value of these above grafted ones.

NOTES ON RECENT RESEARCH
AND
SHORT ABSTRACTS FROM CURRENT PERIODICAL
LITERATURE, BRITISH AND FOREIGN,
AFFECTING
HORTICULTURE & HORTICULTURAL SCIENCE.

THE Editor desires to express his grateful thanks to all who have so willingly assisted in making abstracts. He would be glad if any who have time and who are willing to help in any special direction in making the abstracts more complete would communicate with him.

NAMES OF THOSE WHO HAVE KINDLY CONSENTED TO HELP
IN THIS WORK.

Archer, F. G., F.R.H.S.
Baker, F. J., A.R.C.Sc., F.R.H.S.
Ballard, E., F.R.H.S.
Bowles, E. A., M.A., F.L.S., F.E.S., F.R.H.S.
Brennan, A., B.Sc., F.R.H.S.
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Cavers, Prof. F., D.Sc., F.R.H.S.
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Clayton, C. P., F.R.H.S.
Darlington, H. R., F.R.H.S.
Dykes, W. R., M.A., F.R.H.S.
Ellis, E. T., F.R.H.S.
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Hooper, Cecil H., M.R.A.C., F.R.H.S.
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 Rendle, A. B., M.A., D.Sc., F.L.S., F.R.S., F.R.H.S., V.M.H.
 Reuthe, G., F.R.H.S.
 Ross, R. C. S., F.R.H.S.
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 Simmonds, A., F.R.H.S.
 Smith, William G., B.Sc., Ph.D., F.R.H.S.
 Veitch, Sir Harry J., F.L.S., F.Z.S., F.R.H.S.
 Webster, A. D., F.R.H.S.
 Whittles, W., F.R.H.S.
 Williams, S. E., F.R.H.S.
 Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

| Journals, &c. | Abbreviated title. |
|--|--|
| Agricultural Gazette of New South Wales . . . | Agr. Gaz. N.S.W. |
| Agricult. Journal, Cape of Good Hope . . . | Agr. Jour. Cape G.H. |
| American Journal of Botany . . . | Amer. Jour. Bot. |
| Annales Agronomiques . . . | Ann. Ag. |
| Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault . . . | Ann. Soc. Ht. |
| Annales de la Soc. Nantaise des Amis de l'Hort. . . | Ann. Soc. Nant. des Amis Hort. |
| Annales des Sciences Naturelles . . . | Ann. Sc. Nat. |
| Annales du Jard. Bot. de Buitenzorg . . . | Ann. Jard. Bot. Buit. |
| Annals of Applied Biology . . . | Ann. Appl. Biol. |
| Annals of Botany . . . | Ann. Bot. |
| Annual Report Agricultural Research Station, Long Ashton . . . | Ann. Rep. Agr. Res. Stn., Long Ashton. |
| Beihft zum Botanischen Centralblatt . . . | Beih. Bot. Cent. |
| Boletim da Real Sociedade Nacional de Horticulura . . . | Bol. R. Soc. Nac. Hort. |
| Boletim da Sociedade Broteriana . . . | Bol. Soc. Brot. |
| Bollettino della R. Società Toscana d'Orticulura . . . | Boll. R. Soc. Tosc. Ort. |
| Botanical Gazette . . . | Bot. Gaz. |
| Botanical Magazine . . . | Bot. Mag. |
| Bulletin de la Société Botanique de France . . . | Bull. Soc. Bot. Fr. |
| Bulletin de la Soc. Hort. de Loiret . . . | Bull. Soc. Hort. Loiret. |
| Bulletin de la Soc. Mycologique de France . . . | Bull. Soc. Myc. Fr. |
| Bulletin Department of Agricult. Brisbane . . . | Bull. Dep. Agr. Bris. |
| Bulletin Department of Agricult. Melbourne . . . | Bull. Dep. Agr. Melb. |
| Bulletin of the Botanical Department, Jamaica . . . | Bull. Bot. Dep. Jam. |
| Bulletin of Bot. Dep. Trinidad . . . | Bull. Bot. Dep. Trin. |
| Canadian Reports, Guelph and Ontario Stations . . . | Can. Rep. G. & O. Stat. |
| Centralblatt für Bacteriologie . . . | Cent. f. Bact. |
| Chronique Orchidéeenne . . . | Chron. Orch. |
| Comptes Rendus . . . | Comp. Rend. |
| Contributions from U.S.A. Herbarium . . . | Contr. fr. U.S.A. Herb. |
| Department of Agriculture, Victoria . . . | Dep. Agr. Vict. |
| Department of Agriculture Reports, New Zealand . . . | Dep. Agr. N.Z. |
| Dictionnaire Iconographique des Orchidées . . . | Dict. Icon. Orch. |
| Die Gartenwelt . . . | Die Gart. |
| Engler's Botanische Jahrbücher . . . | Eng. Bot. Jah. |
| Gardeners' Chronicle . . . | Gard. Chron. |
| Gartenflora . . . | Gartenflora. |
| Journal de la Société Nationale d'Horticulture de France . . . | Jour. Soc. Nat. Hort. Fr. |
| Journal Dep. Agriculture, Victoria . . . | Jour. Dep. Agr. Vict. |
| Journal Imperial Department Agriculture, West Indies . . . | Jour. Imp. Dep. Agr. W.I. |
| Journal of Agricultural Research . . . | Jour. Agr. Res. |
| Journal of Agricultural Science . . . | Jour. Agr. Sci. |
| Journal of Botany . . . | Jour. Bot. |
| Journal of Chemical Society . . . | Jour. Chem. Soc. |
| Journal of Ecology . . . | Jour. Ecol. |
| Journal of Economic Biology . . . | Jour. Econ. Biol. |
| Journal of Economic Entomology . . . | Jour. Econ. Entom. |
| Journal of Genetics . . . | Jour. Gen. |
| Journal of the Board of Agriculture . . . | Jour. Bd. Agr. |
| Journal of the Linnean Society . . . | Jour. Linn. Soc. |
| Journal of the Royal Agricultural Society . . . | Jour. R.A.S. |
| Journal of the Society of Chemical Industry . . . | Jour. Soc. Chem. Ind. |

| Journals, &c. | Abbreviated title. |
|---|-------------------------------|
| Journal S.E. Agricultural College, Wye . . . | Jour. S.E. Agr. Coll. |
| Kaiserliche Gesundheitsamte . . . | Kais. Ges. |
| La Pomologie Française . . . | Pom. Franç. |
| Le Jardin . . . | Le Jard. |
| Lebensgeschichte der Blütenpflanzen Mitteleuropas | Lebens. d. Blütenpfl. |
| Mycologia . . . | Mycologia. |
| Naturwiss. Zeitschrift Land und Forst. . . | Nat. Zeit. Land-Forst. |
| New Phytologist . . . | New Phyt. |
| Notizblatt des Königl. Bot. Gart. und Museums zu Berlin . . . | Not. Königl. Bot. Berlin. |
| Oesterreichische Garten-Zeitung . . . | Oester. Gart. Zeit. |
| Orchid Review . . . | Orch. Rev. |
| Orchis . . . | Orchis. |
| Phytopathology . . . | Phytopathology. |
| Proceedings of the American Pomological Society | Am. Pom. Soc. |
| Quarterly Journal of Forestry . . . | Quart. Jour. of Forestry. |
| Queensland Agricultural Journal . . . | Qu. Agr. Journ. |
| Report of the Botanical Office, British Columbia . | Rep. Bot. Off. Brit. Col. |
| Reports of the Missouri Botanical Garden . . . | Rep. Miss. Bot. Gard. |
| Revue de l'Horticulture Belge . . . | Rev. Hort. Belge. |
| Revue générale de Botanique . . . | Rev. gén. Bot. |
| Revue Horticole . . . | Rev. Hort. |
| The Garden . . . | Gard. |
| Transactions Bot. Soc. Edinburgh . . . | Trans. Bot. Soc. Edin. |
| Transactions of the British Mycological Soc. . . | Trans. Brit. Myc. Soc. |
| Transactions of the Massachusetts Hort. Soc. . . | Trans. Mass. Hort. Soc. |
| Transactions Royal Scot. Arboricultural Soc. . | Trans. Roy. Scot. Arber. Soc. |
| U.S.A. Department of Agriculture, Bulletins . . | U.S.A. Dep. Agr.* |
| U.S.A. Experimental Station Reports . . . | U.S.A. Exp. Stn.† |
| U.S.A. Horticultural Societies' publications . . | U.S.A. Hort. Soc.† |
| U.S.A. State Boards of Agriculture and Horticulture | U.S.A. St. Bd.† |
| Woburn Experiment Farm Report . . . | Woburn. |

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.

† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Abies cephalonica Loud. By O. Stapf (*Bot. Mag.* t. 8691; Dec. 1910).—Native of Greece, reaching a height of 100 feet in this country.—F. J. C.

Abies Fraseri. By A. Bruce Jackson (*Gard. Chron.* May 25, 1918, p. 215; with fig.).—The nineteenth of this series of critical notes on Conifers. Refers to two specimens of this rare fir 15 feet high, planted fourteen years ago at Colesborne.—E. A. B.

Absorption of Nutrients as affected by the Number of Roots supplied with the Nutrient. By P. L. Gilc and J. O. Carrero (*Jour. Agr. Res.* ix. p. 73, April 1917).—The authors find the absorption of nutrient substances cannot be efficiently compassed if only some of the roots are in contact with the nutrient. This has, of course, a direct bearing upon the method of distributing nutrients in the soil, suggesting that they should be evenly distributed rather than that they should be placed in one part of the soil only.—F. J. C.

Alpine and Rock Plants. By J. W. B. (*Irish Gard.* xiii., April 1918, pp. 58-61).—A long and interesting article on a fascinating topic. We are a little surprised to read, however, that "the propagation of alpine presents no unusual difficulties." Seed frequently fails to germinate in a satisfactory manner, seedlings are apt to damp off, and even when cuttings are put in they frequently fail to strike root if they are of the choicer plants. These points should be no deterrent to the alpine gardener, but the statement above is a little misleading.—E. T. E.

Aphis abiet (*Irish Gard.* xiii. p. 105, July 1918).—A pest similar to greenfly; very prevalent on *Picea Morinda*, *Maximowiczii*, *obovata*, *omorika*, *orientalis*, and *sitchensis*.

Two sprayings of tobacco water diluted to $\frac{1}{2}$ strength with water, given at intervals of about a month, will effect a cure.—E. T. E.

Aphis, Mealy Plum, Hyalopteris pruni. By J. G. Blakey (*Gard. Chron.* Jan. 5, 1918, p. 1, with 5 figs.).—Records the discovery that eggs are laid on plum from September onward, which remain dormant on the trees, and a large proportion of the insects remain on plum all the year. This makes it doubtful whether previous statements are correct in declaring it to be a form of *H. arundinis* and to pass a great part of the year on grasses.—E. A. Bd.

Apple Blotch and its Control. By John W. Roberts (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 534, pp. 1-11, June 1917; 2 plates).—Apple blotch caused by *Phyllosticta solitaria* attacks the twigs, leaves, and blossoms, as well as the fruit of many varieties of apples grown in Southern United States. The fungus can winter in the diseased twigs and infect the young fruits in the following season. The author believes that the "mummified" apples do not cause much infection. The disease is controlled by three sprayings with 3-4-50 Bordeaux mixture at intervals of three weeks, the first being applied about three weeks after the blossom petals have fallen. Lime sulphur solution may be substituted for Bordeaux mixture where the disease is not severe.—A. B.

Apple Diseases in Indiana. By H. S. Jackson (*U.S.A. Dep. Agr. Exp. Stn. Purdue, Cir.* 70, pp. 1-23, Sept. 1917; 14 figs.).—This paper describes the appearance, cause, and control measures of the following diseases of apples: (1) Apple Scab Fungus (*Venturia inaequalis*); (2) Apple Rust (Cedar Rust) (*Gymnosporangium Juniperæ-virginianæ*); (3) Black Rot (*Physalospora Cydoniæ*); (4) Bitter Rot (Anthracnose) (*Glomerella cingulata*); (5) Blister Canker (*Nummularia discata*); (6) Apple Blotch (*Phyllosticta solitaria*); (7) Xylaria Root Rot (*Xylaria p.p.*); (8) Sooty Blotch (*Lepiothyrium pomi*); (9) Bitter-Pit or Sùppen (cause not yet known).

A spraying schedule is appended for Indiana in controlling these diseases.

A. B.

Apple, Internal Structure of. By E. J. Kraus (*U.S.A. Exp. Stn., Oregon, Bull.* 135, pp. 42; 31 plates).—A large number of apples were sectioned with a view to the study of internal characters for taxonomic and physiological investigation. Clearing and staining processes are described in detail. The bulk of the paper consists of photographs of the stained sections (transverse), which show very interesting differences in the pith areas, and disposition of vascular bundles. Well worthy of study by the systematic pomologist.—E. A. Bd.

Apple-Rot Fungi, Temperature Relations of. By C. Brooks and J. S. Cooley (*Jour. Agr. Res.* viii, pp. 139-163, Jan. 1917; figs.).—The temperature relations of the following fungi which cause rot of apples were studied: *Alternaria* sp., *Aspergillus niger*, *Glomerella cingulata*, *Botrytis cinerea*, *Sphaeropsis Malorum*, *Fusarium radicola*, *Penicillium expansum*, *Sclerotinia cinerea*, and *Cephalothecium roseum*, *Mucor stolonifer*, *Neofabraea malicorticis*, *Volutella inchi*, especially in relation to cold storage. When fruit was placed in cold storage immediately after inoculation rot was either greatly delayed (least with *Sphaeropsis Malorum* and *Sclerotinia cinerea*) or completely stopped. When inoculation was attempted by washing the apples in spore suspensions very rarely was infection secured, pointing to the need for avoidance of punctures and other injuries to fruits to be held in storage.—F. J. C.

Apple Scab Fungus (*Venturia inaequalis*), Ascospore Discharge of the. By Leroy Childs (*U.S. Agr. Exp. Stn., Oregon, Bull.* 143, 11 pp., May 1917).—The author found that ascospores are ejected as early as March 20 at Hood River, and at Corvallis, Oregon, on February 25, and this discharge continues up to June 27 at Hood River, and up to May 20 at Corvallis. This early discharge of ascospores of *Venturia inaequalis* suggests to the author that early spring spraying is essential, and he believes that if an annual study is made to determine the earliest period of ejection of the ascospores throughout the country, recommendations as to the date of spring spraying could be issued and so prevent much loss by this fungus in apple-growing districts.—A. B.

Apple-spot Diseases, Irrigation Experiments on. By C. Brooks and D. F. Fisher (*Jour. Agr. Res.* xii, pp. 109-137, Jan. 1918; plates).—Bitter-pit and Jonathan spot are the troubles dealt with in the main. Bitter-pit was increased by heavy irrigation, but more so by heavy irrigation following medium irrigation. Light irrigation greatly reduced the disease, but at the same time greatly reduced the size of the apples. As is to be expected, large apples showed more disease than small ones, and the conditions conducing to growth also apparently induced the development of bitter-pit. Jonathan spot, a spot disease affecting at first the colour cells only, developed more on apples picked early than on those picked late, but the contrast was less in the later than in the earlier stages of storage. Spots due to aphid attacks, drought spot, cork, and blister are all discussed briefly and characterized.—F. J. C.

Apple Stocks, Investigations on. By B. T. P. Barker and C. T. Spinks (*Ann. Rep. Agr. Res. Stn., Long Ashton, 1917*).—An introduction deals with the importance of distinguishing the characteristics of apple stocks in any experimental work upon the trees. A tentative classification of free stocks based mainly upon their root systems is then given. The difficulties of propagating these free stocks have not yet been entirely overcome, but stool-layering appears to be the most promising method. Whether under different soil conditions the root systems of the different stocks will remain true to type remains to be seen.
F. J. C.

Apple, *Xylaria* Root-rot of. By F. A. Wolf and R. O. Cromwell (*Jour. Agr. Res.* ix, pp. 269-276, May 1917; figs.).—The authors attribute root-rot of apples to the attacks of species of *Xylaria*. Inoculation of the fungus into apple roots led to decay, but the extent of the decay varied in different roots to a considerable extent.—F. J. C.

Apples and Pears: Gathering and Storing the Fruit. By E. A. Banyard (*Gard.* Oct. 6, 1917, p. 422).—The author recommends wrapping each fruit in paper and packing in boxes, such as Tate sugar boxes, which can be placed anywhere protected from the rain. A frost-proof building is not absolutely necessary; if frozen and allowed to thaw gradually the fruit will be none the worse. In gathering the fruit the general rule is to gather when the fruit parts easily from the tree. This does not apply to early varieties, which should be gathered before they come away easily, and they will then ripen slowly indoors. If allowed to ripen on the tree they become poor in flavour, mealy fruit rotting at the core.

Pears especially should be gathered with great care; a flat basket padded at the bottom and filled with only one layer of fruit should be carried by hand into the store.

Late fruits should be left on the tree as long as possible. Early gathering will mean shrivelled fruit. E. M. Hadow (Oct. 20, 1917, p. 442) confirms Mr. Bunyard's observation, that frost will not hurt apples allowed to thaw gradually under cover.—H. R. D.

Apples, Comparative Cooking Quality of Oregon. By A. B. Milam and H. B. Gardner (*U.S.A. Exp. Stn., Oregon, Bull.* 124; Feb. 1915; plates).—Many common varieties were cooked in a variety of ways and judged by points. The authors conclude that different varieties must be used for different specific purposes to obtain the best results. Size of fruit makes little difference in cooking quality of apples for sauce, and sauce-making preserves the flavour better than jelly-making. For sauce, apples in their prime or somewhat over mature are best. Good dessert apples are not necessarily the best for cooking. Apples belonging to the same pomological groups have similar cooking qualities. The sauce-making qualities of an apple vary inversely with the proportion of pith and vascular tissue and the cell cohesion and directly as the size of the cell.

F. J. C.

Apples, Drouth-Spot and Cork in. By A. J. Mix (*U.S.A. Exp. Stn., New York, Bull.* 426, pp. 471-522, Oct. 1916; 12 plates).—Two little-known apple diseases are found in Champlain Valley, New York State. They are non-parasitic in nature, and closely related to the fruit-pit or stippen disease. The names "Cork" and "Drouth-Spot" are suggested for them. Cork is evident in late June as dead brown spots beneath the skin of the fruit and around the core. The fruit is normal externally. Later the fruit becomes distorted and knobby, and brown corky areas are found scattered throughout the flesh.

Drouth-Spot occurs in early June, and depends upon the weather for its development. Sunken, irregular, dead brown spots show in the skin of the fruit, and dead brown areas are seen beneath. In the later stages, the apples become cracked and deformed.

These diseases appear in the best types of soil and in young healthy trees. The only control is the conservation of soil moisture and an equal distribution of moisture throughout the season.—A. B.

Apples: Variation during the Growing Season. By W. E. Whitehouse (*U.S.A. Exp. Stn., Oregon, Bull.* 134).—This investigation sets out to answer the question, "When does an apple make its growth?" It is found, as in other plants, a steady growth without a check depends on an adequate supply of water during the whole season. There is a tendency for the fruit to increase in transverse diameter later in the season. This we have often noticed in such varieties as King of the Pippins, which in a favourable year becomes much more oblate, that is, it makes its height first and then proceeds to increase its girth. Colour is deposited mostly just before gathering.

There is nothing particularly new in the conclusions, but it is interesting to see for once the gardeners' conclusions verified by careful scientific measurement.

E. A. B.

Arsenate of Lead Pastes, Effect of Freezing. By R. A. Datcher (*Jour. Econ. Entom.* 9, p. 561, Dec. 1916; figs.).—The author found the physical condition of arsenate of lead paste was often altered by freezing, so that it was extremely difficult to work them up into a finely divided state for spraying. The powder was not so affected.—F. J. C.

Arsenical Injury through the Bark of Fruit Trees. By D. B. Swingle and H. E. Morris (*Jour. Agr. Res.* viii. p. 283; Feb. 19, 1917; figs.).—An investigation of alleged damage to the trunks of trees by spraying with arsenic compounds was carried out by the authors, who found the intact periderm of the smooth bark of the apple impervious to arsenical solutions. If arsenical solutions find their way through the bark during the growing season more or less injury follows, and this may occur through wounds, lenticels, or latent buds, while in older trees arsenical solutions may find their way into the inner tissues through cracks or fissures in the bark. Roots are similarly liable to injury. If the injury follows entrance through a wound, definite longitudinal streaks will be produced in bark and sapwood, but where the entrance is gained through the stem, such streaks are rarely to be seen. Painting wounds is only a partial protection. Calcium arsenite is the most injurious of the arsenical compounds used in spraying.—F. J. C.

Artanema longifolium Natke. By S. A. Skan (*Bot. Mag.* t. 8687; Nov. 1916).—*Scrophulariaceae* (*Gratiolaceae*). Native of Tropical Asia and Tropical Africa. A herb of which the lanceolate leaves are used in Lagos as a vegetable; of erect habit, and bearing racemes of dark purple flowers.—F. J. C.

Artiehoke, Jerusalem. By M. E. (*Gard. Chron.* May 4, 1918, p. 183).—Deals with the names of this vegetable, and decides that Topinambour was a corruption of Toupinamboux, a name given by the French to some natives of the Isle of Maragnon, Brazil, in 1613, the only connexion between the two being an approximately simultaneous introduction to France. Girasole is here given as the origin of the appellation Jerusalem.—E. A. B.

Asparagus, Rhizoctonia Disease of. By B. T. P. Barker and C. T. Ciminigam (*Ann. Rep. Agr. Res. Stn., Long Ashton, 1917*).—Soil treatment against the attacks of *Rhizoctonia violacea* var. *Asparagi* upon the roots of Asparagus were carried out with promising results; complicated, however, by the fact that the host plant occupies the soil for several years.—F. J. C.

Astragalus. By H. Blin (*Le Jard.* vol. xxxi. p. 175; 1 fig.).—The roasted seeds of *Astragalus galegiformis* may be used as a substitute for chicory for mixing with coffee. Equal quantities of coffee and Astragalus form a good mixture.—S. E. W.

Bacterial Blight of Barley. By L. R. Jones, A. G. Johnson, and C. S. Reddy (*Jour. Agr. Res.* vol. xi. No. 12, pp. 635-644; 4 plates).—The authors find that bacterial blight of barley is very widespread and causes considerable loss. The causal organism is a monotrichous rod, yellow in culture, and has been named *Bacterium translucens* n.sp., and assigned the number 211-2222532 in the Chart of American Bacteria. Inoculation experiments show that the disease is readily induced on barley by spraying with water containing this organism. It, however, does not appear to attack oats, rye, wheat, or timothy.

The organism obtains an entrance through the stomata and passes along the intercellular spaces, producing small water-soaked areas which form yellow to brownish translucent blotches. Similar lesions may appear later upon the glumes, but the chief injury is apparently on the foliage. Soon an exudate appears as cloudy drops which harden into yellow resinous granules, or spread over to form grey flaky films. This exudate and translucent appearance of the lesions are the characteristics of this disease, and distinguish it from the Helminthosporium disease.

The bacterium attacks the chief types of barley; that is, 2 row, 6-row, and erect 6-row varieties, though there is a considerable range of varietal susceptibility to the disease.

Control measures have yet to be worked out, but seed disinfection and avoidance of attacked seed are suggested.

A short bibliography is appended.—A. B.

Beans, Sclerotinia Blight of. By J. A. McClintock (*U.S.A. Exp. Stn., Virginia, Bull.* 20, pp. 417-428, July 1916; 3 figs.).—In the autumn of 1915 a disease causing blight in beans (*Phaseolus vulgaris*) was observed in Tidewater, Virginia. The disease developed after a few days of hot damp weather and attacked stems, leaves, and pods. The fungus isolated was found to be the same as that which causes blight in lettuces; and reproduced by conidia and sclerotia, which can winter for some considerable time in the soil. Experiments with five varieties of beans demonstrated that Bountiful Stringless Green-Pod Wax, Celestial Golden Wax, and Extra Early Black Valentine were more resistant to the *Sclerotinia Libertiana* (Eckl.) than the Extra Early Red Valentine and Extra Early Refugee.

Burning the diseased plants, and deep ploughing, and suitable rotation are suggested as control measures.

Sclerotinia Libertiana can attack lettuce, cucumbers, egg-plants, as well as beans.—A. B.

Belladonna, Some Effects of Selection on the Production of, Alkaloids in. By A. F. Sievers (*U.S.A. Dep. Agr., Bull.* 306, Oct. 15, 1915).—Earlier investigations have established that a wide range of variation exists in the alkaloid content of belladonna plants. Results of further experiments are given to show that first-generation plants from seed of cross-pollinated selected individuals display the characteristic of the maternal parent with regard to alkaloid productivity. This was generally true at all the localities where the experiments were carried on, but there was a considerable difference in the general quantity of alkaloids produced at the different stations. Nothing definite, however, developed to

indicate that a relationship exists between the amount of precipitation and sunshine and the percentage of alkaloids produced.

Plants grown from cuttings tend to show the same characteristics regarding alkaloid production as the plants from which they were propagated and the original parent of those plants.—*M. L. H.*

Bibio johannis L., Larval and Pupal Stages. By Hubert M. Morris, M.Sc. (*Ann. Appl. Biol.* vol. iv. No. 3, Dec. 1917, pp. 91-114; plates).—The morphology of the larva, its habits, food, &c., and the economic significance of the Bibionidae. There appears to be some uncertainty about its destruction of roots of cultivated plants, but various species are recorded as attacking roots of oats, grass, lettuces, cabbages, and flowers in the seedling stage. *Bibio marci* is reported to have attacked tomatoes, potatoes, hop, and certain young tree roots. They are considered to have been introduced in leaf-mould or manure. *Bibio hortulanus* has damaged sugar-beet, spring barley, and wheat, many fields of the latter needing re-sowing. Larvae of *Bibio abbreviatus* are reported to have destroyed the soft tissues between the fibro-vascular bundles of celery stalks. The adults of *B. marci* are believed by one observer to have damaged fruit blossom, but some doubt is thrown upon it.

The larvae seem commonly to be found in cow-dung and other organic manure. They live near or at the soil level among roots of pasture grasses, within $\frac{1}{2}$ inch of the surface and usually lying closely together in small colonies. Vaporite and injections of carbon bisulphide have proved useful against them. Domestic poultry, rooks, starlings, and chaffinches devour them readily. Spraying infected land with nitrate of soda solution in early spring, and harrowing in autumn or early spring after spreading quicklime, are recommended for field treatment. Deep ploughing and rolling at time of pupation have given satisfactory results. Contact poisons have not been effective, but trapping by burying old roots in the soil for digging up in March, and dressings of soot and lime, have proved useful.—*R. C. S. R.*

Blackberries, Cultivated, Native. By J. C. Varty Smith (*Gard.* Oct. 13, 1917, p. 431).—The first and most important point is to procure canes of only those varieties that are most productive and with largest fruits, as well as early and vigorous in growth. The question is asked why we do not cultivate our native blackberries. They will be found to give greater satisfaction than many American varieties, especially in the north. A little liberal attention in manuring increases the production, as well as the size of the fruits; and they can be left to ripen instead of being gathered when half ripe, as is often the case in positions where they are another's property.

Some hundreds of varieties of wild blackberries exist in the British Isles. Many are too rare as well as useless for the purpose. They should be selected when in fruit, and marked for removal to the garden in autumn or early spring.

Rubus Kolleri possesses all the good qualities necessary. When once a few canes are planted they can be extended by burying the tips of the long shoots in the soil, when they soon root. All the old wood should be cut out in February or March, the new shoots arranged where they can obtain equal light and sunshine, and a top dressing with manure provided.

On p. 478 Mr. James Britten points out that the true name of the above variety is *Rubus Koehleri*.—*H. R. D.*

Blackberry Culture. By George M. Darrow (*U.S.A. Dep. Agr., Farm. Bull.* 643, Jan. 29, 1915; figs.).—The cultivation of named varieties of the blackberry in America was started about 1850, and since that time at least 140 different named varieties have been introduced. According to the reports of the 1910 census there were 49,004 acres devoted to the cultivation of blackberries and dewberries in the United States in 1909.

A table in this bulletin shows the distribution of this acreage by States. It also contains information on choice of situation, soil, propagation, pollination, planting, fertilizing, and systems of training. A descriptive list of varieties is given.—*M. L. H.*

Black Currant, Big-Bud Mite. By A. H. Lees (*Ann. Rep. Agr. Res. Sta., Long Ashton, 1917*).—Reports partial success in spraying against big-bud, but followed by wholesale infection in the succeeding year.—*F. J. C.*

Black Currants, "Reversion" in. By A. H. Lees (*Ann. Rep. Agr. Res. Sta., Long Ashton, 1917*).—The author expresses the opinion that the so-called reversion is the result of injury to the terminal bud. A further paper is promised.
F. J. C.

Brassicæ, Clubbing In. By Clarence Ponting (*Gard. Dec.* 15, 1917, p. 541).—Dr. Potter having suggested in vol. 42 of the R.H.S. JOURNAL that the spores of *Plasmodiophora* are killed or rendered inoperative below a depth of 4 or 5 inches, the author records a successful experiment of planting some rather leggy plants of cottagers' kale with a dibber quite 6 inches below the surface in infested ground.—H. R. D.

Calcium Compounds in Soils. By E. C. Shorey, W. H. Fry, and W. Hazen (*Jour. Agr. Res.* viii. pp. 57-78, Jan. 1917).—Sixty-three samples of soil were examined for calcium compounds, viz. carbonate, sulphate, humus compounds, and in easily and difficultly decomposable silicates, and a wide variation in total calcium and in content of calcium carbon and the two classes of silicates was found. In twenty-nine cases calcium in combination with humus compounds was found to be absent. Five samples were acid to litmus and were characterized by poor drainage. It seems probable that soils rich in total calcium, but poor in calcium carbonate, may be better suited for some crops than soils with high calcium carbonate content.—F. J. C.

Callicarpa Giraladiana Hesse. By O. Stapf (*Bot. Mag. t.* 8682).—*Verbenaceæ* (*Viticeæ*). A hardy shrub of easy culture. Six feet in height. Leaves, elliptic lanceolate, 3-5 inches long. Flowers small, in subglobose panicles, whitish. Fruits, for which the plant is most worth growing, lilac. One of the most beautiful of recently introduced fruiting shrubs. Native of W. Szechwan, through Hupeh to Shensi.—F. J. C.

Capsid Bug of Apple: Control by Spraying. By F. H. Petherbridge (*Jour. Bd. Agr.* vol. xxiv. No. 12; March 1918).—An illustrated article showing damage done to apples, especially certain varieties, such as 'Lady Hollandale,' 'Early Victoria,' 'Grenadier,' and 'Lord Grosvenor.' It was found that the bug (*Plestocoris rugicollis*) could be controlled by spraying with a soft soap and nicotine spray. The best time for spraying is said to be ten days after the first marking of the leaves by Capsids, as then most or all of the Capsids will have hatched. Growers who are able to spray twice should do so in the case of a bad attack, once before blossoming and again just after blossoming. The amount of soap used varies with the hardness of the water, 10 lb. per 100 gallons being sufficient for soft water, while amount of nicotine should be from 7 8 oz. to the 100 gallons of water.—G. C. G.

Carnations, The Use of Commercial Fertilizers in Growing. By H. B. Dörner, F. H. Mencie, and A. H. Fehrling (*U.S.A. Exp. Stn. Ill., Bull.* 176).—Commercial fertilizers are equally as good as farmyard manure for this crop.

Both dried blood and sulphate ammonia were used as sources of nitrogen, and when combined with acid phosphates and sulphate of potash produced flowers both in quantity and quality equal to the best results obtained from stable manure.

An excess of nitrogenous fertilizer or sulphate of potash proved disastrous to the crop, destroying a whole stand of blooms in a few weeks. On the other hand, a large dose of acid phosphates, 2½ lb. per 100 square feet of bench once a week, both improved quality and quantity of the blooms on the particular plot treated.—C. P. C.

Cauliflower, Ring-spot of. By A. V. Osman and P. J. Anderson (*Phytopathology*, v., pp. 260-265; figs.).—A destructive leaf spot of cauliflower is described due to the same fungus as attacks cabbages in England (see JOURNAL R.H.S. xl., p. 76) (*Mycosphaerella brassicicola*). No control measures are reported.—F. J. C.

Cedars, A Nursery Blight of. By G. C. Hahn, C. Hartley, and R. G. Pierce (*Jour. Agr. Res.* x. pp. 533-539; Sept. 1917; plates).—*Juniperus virginiana* has been attacked by a fungus in the nursery beds, but rarely when over four years old, and large numbers of plants have been killed. The diseased plants appear as though killed by drought. A species of *Phoma* has been found which is capable of acting as a wound parasite, not only on *J. virginiana* but also on *J. barbadensis*, *J. pachyphloea*, *J. communis*, *J. communis sibirica*, *J. prostrata*, *Thuja occidentalis* and *T. orientalis*, and *Cupressus glabra*.—F. J. C.

Cedar Rust Fungi. By J. L. Weimer (*U.S.A. Exp. Stn., Cornell, Bull.* 390, May 1917; figs.).—The fungi described in this paper have as hosts on the one hand species of Juniper, especially *Juniperus virginiana*, and in their aecidium stage various Rosaceæ. Economic loss amounting to many thousand dollars

annually is reported from certain States, especially where apple and juniper are growing in close proximity. *Gymnosporangium Juniperi-virginianae*, *G. globosum*, and *G. clavipes* are the species dealt with.—F. J. C.

Chenopodium, A Desirable Vegetable. By E. Meunissier (*Rev. Hort.* vol. xc. pp. 15-17).—*Chenopodium purpurascens*, *amaranticolor*, and *album* are of easy culture. Sow on a hot bed about the middle of April and prick out ten days later. It is not particular as to soil, and does not run to seed in hot weather. It is superior to spinach in flavour.—S. E. W.

Christmas Tree Plantations. By A. K. Chittenden (*U.S.A. Exp. Stn., Michigan*, 1916).—To determine the practicability of growing Christmas trees as a farm crop, an experimental plantation was established in 1909. Sufficient time has now elapsed to warrant definite conclusions being drawn from this plantation.

Four-year-old Norway spruce transplants were used. These trees were about 14 feet high, good, strong, sturdy stock. They were planted with a triangular spacing of 3 feet, at the rate of 5,584 to the acre. The marking was done with a horse marker.

For Christmas tree purposes too rapid growth is not desirable. If the trees grow faster than one foot a year they become spindly. The best Christmas trees are those that grow rather slowly. They are bushier and better shaped than very rapidly grown trees.—A. D. W.

Clechorum Intybus, Fertility in; Self-compatibility and Self-incompatibility among Offspring of Self-fertile Lines of Descent. By A. B. Stout (*Jour. Genetics*, vol. vii. pp. 71-104, Feb. 1918; plates).—The author shows that sterility develops in chicory independently of anatomical incompatibility or embryo abortion, such as occurs through malnutrition of embryos. The degree of self-compatibility appears to vary, and selection for self-fertility after two generations was not effective in producing a completely self-fertile strain. Both phenomena occur in both cross-bred and in-bred races.—F. J. C.

Cider Apple Jelly, the Manufacture of, Cider Industry in Relation to Present-Day Food Problems. By B. T. P. Barker (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1917).—The utilization of apples and pears generally made into cider for food purposes (jam and fruit pulp, jelly, syrup, and culinary purposes), the avoidance of losses that usually occur in dealing with the cider fruits, and the improvement of grass orchards are dealt with in these papers, which should be consulted.

F. J. C.

Cider Vinegar. By O. Grove (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1917).—To make cider vinegar the acetic ferment (*Bacterium xylinum*) (which is present in all unpasteurized samples) must be present, air must have free access to the cider, and it must be kept at a temperature of 65°-85° F. Fermentation may be started by the addition of a little good vinegar to cider in a wooden cask, which is placed on its side, has a hole of about 1 inch diameter at each end and a funnel with a rubber tube dipping into the cider through the bung-hole. The funnel and the holes should be covered with fine gauze.—F. J. C.

Ciders, Single Variety. By O. Grove (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1917).—The chemical composition &c. of various ciders made in 1916-17 is given.

F. J. C.

Citrus Fruits, A New Machine for Peeling. By S. C. Hood (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 399, Dec. 16, 1916, pp. 13-19; 5 figs.).—By the use of this machine, one man can in one hour remove the peel from 2 tons of oranges or from 3½ tons of grape fruit. The peel comes from the machine in a finely divided condition suitable for the extraction of the oil, and the peeled fruit is delivered in a condition suitable for use in the manufacture of various food products. A full description of the machine and its working is given.—F. G. A.

Citrus "Mottle-leaf": The Mulched-basin System of Irrigation and Its Bearing on the Control of. By L. J. Briggs, C. A. Jensen, and J. W. McLane (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 499, Feb. 12, 1917, 31 pp.; 1 plate, 12 tables).—In a previous paper (dealt with in these Abstracts, vol. xlii. p. 486), the authors showed that mottle-leaf of citrus trees was apparently associated with a deficiency of organic matter in the soil, and perhaps also inadequate irrigation. Further experiments made in a commercial orange-grove in California now indicate that the furrow system of irrigation and intensive surface cultivation may be in part

responsible. The present paper deals with a new method of citrus cultivation, which the authors call the mulched-basin system. Low dikes are thrown up so as to form large shallow irrigation basins near each tree, and each basin is heavily mulched with lucerne hay, bean straw, manure, or some other organic material. The basin makes it possible to supply each tree with water according to need, while the water carries plant food from the mulch to the roots of the trees.

The mulched-basin system was found to conserve the soil moisture better than any other system tested, and none of the basined trees on either light or heavy soils wilted. Under all the other cultural methods employed, wilting occurred at some period during the summer.

Circular trenches dug around orange trees, filled with manure or alfalfa and covered with dirt, did not remain sufficiently open after the second irrigation to distribute the irrigation water adequately.

For a basin having an area of 150 square feet, the experiments indicate that approximately 150 lb. of alfalfa or 15 to 20 cubic feet of stable manure will be required each year to maintain an effective mulch.

The new leaves on the basined trees were less mottled, larger, and darker in colour, and the new growth of rootlets was very much greater.

No soil crust of any kind has been found in the basins where the mulch completely covered the soil surface.

The experiments indicate that lucerne and bean straw are superior to stable manure for mulching purposes.

The use of an organic mulch moderates the rise in soil temperature during the day.—*F. G. A.*

Clematis *foliolata* J. Buch. By T. A. Sprague (*Bot. Mag. t. 8686*; Nov. 1916).—A curious species with leaflets suppressed and only petioles developed. A native of New Zealand, it flowered on a sunny wall at Warley Place, and is probably hardly only in the warmer parts of the British Isles. Its whitish flowers are about $1\frac{1}{4}$ inch in diameter, and apparently freely produced.—*F. J. C.*

Clematis Armandi. By E. A. Bowles (*Gard. Dec. 1, 1917, p. 519*).—This is one of a century of certificated plants (1914) introduced from China by Dr. E. H. Wilson.

It is one of the most distinct hardy climbing plants by reason of its handsome leaves, which were not hurt by the winter 1916-17. It is evergreen and almost as handsome in mid-winter as in mid-summer, and only more beautiful than from the contrast between the dark olive-green of the old growths which set off the rich yellow-green of the young. It does not show its true beauty until it is allowed to produce hanging growths of three seasons.

Evergreen climbers are rare, and except Ivies look rather woebegone in March, when this Clematis pushes along its flower-buds, developing emerald-green bracts among its oldest and most sombre leaves. The flowers appear in April, the earliest rather small and greenish, but in a spell of warm weather they make a good show, those at the end of the month being almost white and of good size. The seeds ripen in July, and look like pale-green spiders with long hairy white legs, and before they have fallen there is a second blossoming.—*H. R. D.*

Clubroot of Cruciferous Plants, Studies on. By C. Chupp (*U.S.A. Exp. Stn., Cornell, Bull. 387*; March 1917; plates).—The author finds that neither the wind nor the power of locomotion possessed by the swarm-spores of *Plasmiodiophora Brassicae* are of importance in disseminating the fungus. He was able to germinate spores and carry out infections which point to the fact that bacteria so frequently found in the "clubs" are not necessary to the subsistence of the fungus, but merely invade the tissues of the host after the rupture of the host cells. The fungus is able to penetrate cell walls, and infects the host through the root hairs. Another organism, apparently *Olpidium Brassicae*, is frequently present in the infected roots. It causes no hypertrophy.—*F. J. C.*

Codling Moth in Maine, Life History of the. By E. H. Siegler and F. L. Simanton (*U.S.A. Dep. Agr., Bur. Ent., Bull. 252*, Aug. 10, 1915, 50 pp.; 9 figs., 41 tables).—The life-history studies recorded were conducted during the seasons of 1913 and 1914. The codling moth in Maine may be controlled with one spray thoroughly applied as soon as the petals drop. Arsenate of lead paste 2 lb., or powder 1 lb., to each 50 gallons of water, is recommended.—*F. G. A.*

Codling Moth Trap. By E. H. Siegler (*Jour. Econ. Entom.* 9, pp. 517-520, Dec. 1916; fig.).—A trap for codling moths is figured. It is said to have been used with great effect, and is a modification of the autumn hayband method of dealing with the pest.—*F. J. C.*

Coleosporium ribicola, Aecial Stage of. By W. H. Long (*Mycologia*, viii. No. 6, p. 309, Nov. 1916).—A Peridermium was found on needles of *Pinus edulis* in New Mexico. Spores inoculated on *Ribes leptanthum* produced the typical *Coleosporium ribicola*. Spores from this produced the same on *R. longifolium*. In addition to these, the fungus has been found on *R. Grossularia*, *R. inebrians*, *R. pumilum*, *R. Purpusii*, *R. valicola*, and *R. mescalegium*.—F. J. C.

Cranberries, End Rot of. By C. L. Shear (*Jour. Agr. Res.* vol. xi. No. 2, pp. 35-41; 1 plate).—The author states that the end rot disease of the Cranberry (*Oxycoccus macrocarpus*) is caused by a fungus hitherto not described. It is found throughout the United States, and attacked particularly the variety 'Late Howe.' The disease may start at the blossom or stem end of the berry, and causes complete decay of the fruit. In culture media only the pycnidia have been obtained. A characteristic series of colours in the mycelium and pycnidia are formed when grown upon stems of *Melilotus alba* in culture conditions. Spraying with Bordeaux mixture usually effectively controls this disease. The author has given the name *Fusicoccum putrefaciens* n.sp. to this fungus.—A. B.

Cranberry, False Blossom of. By C. L. Shear (*U.S.A. Dep. Agr., Bull.* 444, pp. 8; 2 plates).—A malformation of the flower of the Cranberry causes considerable losses in Wisconsin plantations and elsewhere. No cause can be assigned save a lack of nutritive balance; better cultivation offers the only remedy.—E. A. Bd.

Cranberry Rootworm. By H. B. Scammell (*U.S.A. Dep. Agr., Bull.* 263, pp. 8; 2 plates).—*Rhabdopterus picifex* does much damage in New Jersey to Cranberry bushes by feeding on the roots of the plants. Remedial measures have not been discovered, but invigorating the plants by sand and fertilizers is recommended.—E. A. Bd.

Crocus chrysanthus, Warley Variety. By G. A. Bowles (*Gard.* p. 100, March 24, 1917).—*Crocus chrysanthus* is the most variable in colour of the species. It was first known in its plain rich yellow form. Maw found (i) forms with bronzed or feathered outer segments, golden within, which he named; (ii) white forms with golden throat (var. *albidus*); (iii) white flowers outwardly suffused with lilac (var. *caerulescens*). The author had raised several generations of the latter, some of which appeared to be reverting to the yellow type when he received some bulbs from Hoog of Haarlem. These proved to *C. chrysanthus*, and it was thought some of its seedlings might give yellow forms, which proved to be the case at Haarlem. The flowers from the bulbs were shown by Miss Willmot, February 14, 1905, and received an A.M. under the name Warley variety. They are soft creamy yellow with rich orange throat and scarlet stigmata, and flower in February.—H. R. D.

Currants, A Revision of the Red. By E. A. Bunyard (*Gard. Chron.* Nov. 24, Dec. 1, 8, and 15, with 9 figs.).—Shows there are five main groups descended from three distinct species. *Ribes vulgare*, with distinct fleshy ring around pistil. *R. rubrum*, with no fleshy ring. *R. petraeum*, with claret-red flowers and red shoots.

The groups are arranged thus:—

- I. Raby Castle Group.—Soft downy leaves, derived from *R. rubrum pubescens*.
- II. Versailles Group.—Short stems easily broken. Descendants of a large form of *R. vulgare* known as *macrocarpum*.
- III. Gondolin Group.—Stout wood, coriaceous leaves, red flowers, form of *R. petraeum*.
- IV. Scotch Group.—Stiff upward folding foliage. Bell-shaped flowers tinged with red. Show descent from *R. rubrum*.
- V. Dutch Group.—Large light-green leaves. Flower of *vulgare* type.

E. A. Bd.

Cyclamen Mite. By G. F. Moznette (*Jour. Agr. Res.* x. pp. 373-390; Aug. 1917; figs.).—*Tarsonemus pallidus*, a species allied to the Begonia mite of our own greenhouses, has done great damage to Cyclamen in America. It also attacks Chrysanthemums and Antirrhinums. The attack is generally upon leaves just unfolding, causing distortion and frequently thickening in the portions adjacent to the damaged areas. Flower buds are also attacked, and discoloration of the flowers follows. Blotching and streaking of the flowers and their rapid death are the common symptoms in this part of the plant. The mites, which are very small, difficult to discover, and hide in parts of the plant away from the light, are described and figured. Various methods of control have

been tried. Fumigation is useless. Spraying with a nicotine compound gave the best results. [The soft soap and sulphur dip which has proved so useful with begonia mite in England does not appear to have been tried. It is made by kneading flowers of sulphur into a handful of soft soap and dissolving the mixture in $1\frac{1}{2}$ gallon of water.]—F. J. C.

Cymbidium ensifolium. By J. Gattafosse (*Le Jard.* vol. xxxii, pp. 245, 246; 1 fig.).—*Cymbidium ensifolium* is grown in large quantities in China, where it is regarded as the queen of flowers. The orchid is grown in basin-shaped pots under glass with a minimum temperature of 50° F. A light soil containing peat mixed with half its bulk of powdered shell and plenty of water is desirable. A solution of 100 grammes of ammonium phosphate, 60 nitrate, 10 carbonate, and 8 grammes of potassium nitrate makes an excellent fertilizer.—S. E. W.

Cytisus monspessulanus Linn. By O. Stapf (*Bot. Mag.* t. 8685; Nov. 1916).—Shrub 3 to 9 feet high, native of Mediterranean region and Canaries. Introduced before 1735. Killed by 15°–20° of frost, but seeds easily obtained from South France. Flowers bright yellow in clusters in May.—F. J. C.

Dahlia 'Suzanne Lebre.' By F. Cayeux (*Rev. Hort.* vol. xc. p. 10; 1 col. plate).—'Suzanne Lebre' forms a bush about one yard in height. It bears numerous flowers of a delicate tint, which are intermediate between the Cactus and the decorative dahlias. The flowers are slightly incurved at the centre and recurved at the periphery.—S. E. W.

Dendrobium Palpebrae Lindl. By R. A. Rolfe (*Bot. Mag.* t. 8683; October 1916).—Native of Burma, and first introduced by Messrs. Veitch from Moulemein, in 1849. Flowers white, lip with yellow or orange disk and a markedly ciliate margin. Thriving in company with *D. thyrsiflorum* and *D. densiflorum*.
F. J. C.

Disanthus cercidifolia. By A. O. (*Irish Gard.* xiii., Jan. 1918, p. 6).—This comparatively little-known shrub is quite hardy out of doors. Well-drained loamy soil is desirable, containing leaf-mould and peat. It blooms in October.
E. T. E.

Dunes, Control of. By F. H. Sanford (*U.S.A. Exp. Stn., Michigan*, May 1916).—Vast amounts of money have been spent on sand dune reclamation, some to good purpose followed by entire success, and some in the form of experiment. This experimental work has demonstrated satisfactorily the possibility of control. Dunes which occur near salt water present greater difficulties in their control than those lying inland or near fresh water. The humidity of the locality as well as the total annual and seasonal rainfall all contribute their effects. The Great Lakes sand dunes are favoured in this respect. The lake winds are heavily charged with water and the annual rainfall amounts to from thirty-five to forty inches on the Lake Michigan shore and from twenty-six to thirty inches on the Huron and Superior shores. Under such moisture conditions, and with the absence of the deleterious influence of the salt spray of other regions, successful reclamation of shifting sand may be assured.

Beach grass, known also as Sea Sand Reed, Sea Matweed, and Marram, *Ammophila arenaria* (L.) Link. is the most valuable grass known to hold drifting sand. It is found along all the shores of the Great Lakes and grows vigorously. It is particularly valuable because of its root-stalk growth, which enables it to grow up through rapidly accumulating sand.

Sand along the Michigan shores can be controlled if proper methods are applied. Certain plants are admirably adapted for use in establishing a "crust" in which other forms of tree growth must be planted to insure permanent forest cover.

By waiting for planted belts to grow into high shelters, certain adjacent belts in the lee may be utilized by the growth of certain forest crops, or orchards, but never by annual crops.

Studies of planting done from ten to twenty years ago point out the imperative need of establishing and maintaining a solid cover on the windward slopes of all dunes.

Planting must begin there so as to establish a facing of low forms that are capable of withstanding the rough treatment to which they will be subjected.

In all dune formations where the sand is cast up by water a control shelter of hardy shrubs must be set as close as possible to the winter line of high water and ice. An artificial barrier of drift material and wood forms a splendid protection and justifies expense to establish it.—A. D. W.

Dusting and Spraying Nursery Stock. By V. B. Stewart (*U.S.A. Exp. Sin., Cornell, Bull.* 385, January 1916; figs.).—The application of a dry mixture of 90 parts sulphur (passing 200-mesh sieve) with 10 parts arsenate of lead to horse-chestnut, currant, plum, cherry, quince, and rose trees in the nursery kept leaf diseases in check. The method was rather more expensive than spraying with liquid sprays, but it is claimed was quicker and more thorough. The greatest importance is attached to fine grinding.—*F. J. C.*

Echiums, Frutescent. By D. Bois (*Rev. Hort.* vol. lxxxix, pp. 346-347, 376-378; 3 figs.).—On account of its resistance to cold, *Echium Wilajepetii* is most suitable for cultivation in Europe. *E. violaceum*, *E. candicans*, and *E. Pininana* approach it in hardiness. Those varieties which only possess one flower-stalk die after flowering, but certain hybrids produce several flower-stalks and flower for several years; for example, *E. simplex* × *candicans*, and *simplex* × *Decaisnei*.—*S. E. W.*

Eucomis Pole-Evansii. By N. E. Brown (*Gard. Chron.*, May 4, 1918, p. 185; with fig. and Latin diagnosis).—This new species, found in the Transvaal, produces flower-stems 5 to 6 feet high and is nearest akin to *E. pathaiflora*.—*E. A. B.*

Farm Manures. By J. C. Beavers (*U.S.A. Exp. Sin. Purdue, Cir.* 49, March 1915).—A treatise on the composition, conservation, and general treatment of farmyard manures. The author recommends concrete pits for storage, and the addition of some form of phosphates as aids to the conservation of the fertilizing values of such manures.—*C. P. C.*

Farmyard Manure, Changes taking Place in the Storage of. By E. J. Russell and E. H. Richards (*Jour. Agr. Sci.* vol. viii, part 4, Dec. 1917, pp. 495-563; fig. 9, tables 10).—It is well known that there is a serious loss of nitrogen in the cultivation of land rich in organic matter. At Rothamsted about one-third of the nitrogen added to the soil is recovered in the crop, a certain amount is stored in the soil, and some passes away in the drainage water. Only a little more, however, than 50 per cent. is thus accounted for, and it is difficult to avoid the conclusion that some escapes in the gaseous state. The authors are investigating the general problem, and the present paper deals with one section of it only, namely, the conditions under which the changes in farmyard manure in bulk occur and the character and amount of the changes under varying conditions. Experimental work was conducted both in the laboratory and on heaps. It is found that if manure is stored under strictly anaerobic conditions and at a temperature of about 26° C., the nitrogen is converted into ammonia and there is no loss of nitrogen. On the other hand, the laboratory experiments show that with complete aeration there is also no loss of nitrogen. Neither of these two ideal and opposite conditions are possible of attainment in practice, however; but we can approximate to the former by leaving the manure under the beasts in boxes or covered yards until it is wanted, or by storing the manure in water-tight tanks or pits which can be kept closed. The worst method of keeping manure is to allow it to be exposed to rain and air in loosely compacted heaps.—*J. E. W. E. H.*

Flax Wilt. By W. H. Tisdale (*Jour. Agr. Res.* No. 11, vol. xi, Dec. 1917, pp. 573-606; 3 plates).—This disease is highly destructive to common flax (*Linum usitatissimum*), and frequently causes the loss of the entire crop. The causal organism is *Fusarium lini*, which enters the flax plants by means of the root hairs, stomata, or wounds in epidermal surfaces. The fungus invades the various tissues of the plant, and finally wilting takes place. Wilting may be due to the combined action of several factors: (a) Destruction of root system; (b) use of food and water supply of the plant by the fungus; (c) vigorous growth of fungus; (d) possible formation of toxins by fungus. Resistance to wilt fungus is an inheritable character, which is determined by multiple factors; considerable variation in the plants of a strain with regard to resistance is seen in their offspring. Even North Dakota Resistant No. 114 (the best strain) is not entirely resistant with the high summer temperatures in the greenhouse. Various experiments are described in the production of semi-resistant varieties. A short bibliography is appended.—*A. B.*

Flowering Plants of January. By B. (*Irish Gard.* xiii, Feb. 1918, pp. 18-20; 2 figs.).—The writer gives a list of over a dozen such plants, with interesting particulars about them. These include various species of *Ericas*, *Inscs*, *Prunus*, *Rhododendron* &c., as well as *Lonicera fragrantissima*, *Chimonanthus fragrans*, *Hellebores*, *Clematis*, and *Galanthus*.—*E. T. E.*

Flowers of February. Anon. (*Irish Gard.* xiii., March 1918, pp. 38-39).—An interesting article describing a number of flowers blooming in February.—E. T. E.

Flowers of March. By J. W. B. (*Irish Gard.* xiii., April 1918, pp. 53-54).—Dealing with the more important flowers blooming during that month.—E. T. E.

Flowers of April. By J. W. B. (*Irish Gard.* xiii., May 1918, pp. 70-72).—Dealing with shrubs and plants in bloom during April.—E. T. E.

Flowers of May. Anon. (*Irish Gard.* xiii., June 1918, pp. 86-88).—Possibly the article is not intended to cover all the more common May-blooming flowers, for we cannot find in it any mention of *Doronicums*, *Lupinus polyphyllus* and several other plants which usually bloom from the middle to the end of May. E. T. E.

Fruit Blossom Bacillus. By O. Grove (*Ann. Rep. Agr. Res. Stn., Long Ashton, 1917*).—The organism which has been isolated from fruit blossoms was found in the soil, and especially about the roots of various plants. It is suggested that it possibly aids growth in some way, for germination in sterilized soil was much more rapid where the soil had been inoculated with the bacillus than in its absence.—F. J. C.

Fruit Buds, The Freezing of. By F. L. West and N. E. Edlisen (*U.S.A. Exp. Stn., Utah, Feb. 1917*).—When plant tissue freezes, water passes out of the cells and ice forms in the intercellular spaces. It has been found that if the thawing is done slowly enough when working with tender plants, such as lettuce and matured fruits, the water will gradually pass back into the cells, and if the original freezing did not rupture the cell wall, the plant has suffered little harm from the ice formation. If, however, the thawing is done rapidly, the water does not get back into the cells and they die through drying out. We must have then either a rupturing of the cell wall when the ice is formed or else ice formation and in many cases rapid thawing in order to kill the tissue.

Summary.—1. Many Utah orchards are poorly located from the standpoint of topography and its relation to frost.

2. Some of these orchards are paying good returns, although frost occasionally destroys the crop.

3. In many States, loss from frost has been avoided by artificially heating the orchards.—A. D. W.

Fruit Crop and Fruit Prospects (Ireland), 1917. By W. S. Irving (*Irish Gard.* xii., Aug. 1917, pp. 120-122).—The first two pages consist of a table of reports from a very large number of Irish districts by different gardeners, &c. These reports cover all the more important classes of hardy fruit. The last page is taken up with an account of the Irish 1917 Fruit Crop.—E. T. E.

Fruit Industry. Anon. (*Irish Gard.* xiii., April 1918, p. 54).—Brief notes on the important matter of the Irish Fruit Industry.—E. T. E.

Fungus Fairy Rings in Colorado and their Effect upon Vegetation. By H. L. Shantz and R. L. Piemeisel (*Jour. Agr. Res.* xi. Oct. 1917, pp. 191-245; 20 plates).—A large number of fungi have been shown to produce "fairy rings," those characteristic circles of vegetation which so commonly occur in meadows and fields. The authors deal only with those fleshy fungi which produce these rings in Western Colorado, and find that *Agaricus tabularis* is largely concerned in their formation. This fungus produces an enormous number of spores, and their germination and growth as mycelium cause the fairy rings to develop. The ring starts from the point of germination of the fungus spore and spreads outward at approximately an equal rate in all directions. Where an obstacle—ant-hill or another ring—is encountered, growth stops at this point. The effect of the fungus hyphae on the soil is to reduce a part of the organic matter to ammonia, which may be converted by bacteria into nitrites and then nitrates. This increase in available nitrogen in the soil stimulates the growth of the grasses and other plants, which therefore make a greater demand on the soil moisture. When this is once exhausted (in *A. tabularis*) the mass of fungus hyphae prevent the penetration of rain water. The drought produced kills off the various grasses, and so the area becomes bare. After some time the mycelium of the fungus dies and leaves the soil further enriched and pervious to water. The first stage in the succession on this bare area is (1) an early-weed stage followed by (2) a late-weed stage. Then comes (3) a short-lived grass stage, followed by (4) a perennial stage, which is succeeded by (5) the original short-grass covering.

A full bibliography is given at the conclusion of the paper.—A. B.

Forest Management in New York State, Possibilities of Private. By Cedric H. Guise (*U.S.A. Exp. Sm., Cornell, April 1916*).—Within the boundaries of the State of New York some 34,000,000 acres are included, of which 12,000,000 acres are in woodland. The bulk of State-owned land lies within the Adirondack and Catskill preserves. These preserves are situated in parts of sixteen counties, consist of nearly seven thousand scattered parcels, are bounded by almost nine thousand miles of line, and are intermixed with over three times as large an area of private forest land. This private property is controlled by corporations, private clubs, associations, and individuals.

At the present time a bulk of forestry work in New York is carried on almost entirely by the State Government. In a few cases private estates have their own foresters, but generally such work is carried on in co-operation with the State Forest Service. The work of the Conservation Commission was primarily for State lands, but private owners can derive great benefit from its efforts.

Reforestation work has steadily progressed. The State supplies at cost to private parties, trees for planting, and each succeeding year shows an increased number of trees shipped from the State nurseries. Since 1908, when the State first began this work, 14,624,000 trees have been supplied for reforestation.—A. D. W.

Forest Planting in New York State, Reforesting Methods and Results of. By B. H. Paul (*U.S.A. Exp. Sm., Cornell, April 1916*).—The majority of the plantations in the State are comparatively young. Very little reforestation was done prior to the year 1899, when the New York State College of Forestry at Cornell University made its first forest plantation at Axton, in the Adirondacks. Since 1899 planting has been done on State lands nearly every year, and up to the present time a total of over 7,000 acres has been reforested within the Adirondack and Catskill forest preserves.

In 1908 the State began supplying trees to individuals at cost, and from these sales about 15,000 acres of privately owned lands have been reforested. In addition, 3,000 acres of State land have been reforested at various State institutes, and between 5,000 and 6,000 acres have been privately reforested with trees purchased from commercial dealers or grown in private nurseries.

Plantations established prior to 1899 with imported nursery stock or by sowing tree seeds are to be found at Mill-brook and at White Lake Corners. The age of these plantations ranges from eighteen to forty-four years; the present yields are given on pages 679 and 687 of this bulletin.

Two men working together by the hole method can plant, on an average, from one thousand to twelve hundred trees in a day. On sandy soils with very little sod or grass, as many as fourteen hundred have been planted by two men in one day. On very stony soils, or where there is a heavy sod, the rate of planting is relatively lower. The average cost of planting should not exceed six dollars an acre under favourable conditions. The total cost of establishing a plantation, including cost of trees, freight, and labour, varies from seven to twelve dollars an acre.—A. D. W.

Forestry (*Quart. Jour. Forestry*, Jan., Apr., July 1917).—Spring frosts occur chiefly in moist situations, and in hollows or valleys. In the former the great evaporation of the soil moisture makes the nights cold, and in the latter the evaporation produces heavy cold layers of air, which there are no winds to blow away. This cold air hangs close to the ground, and often trees 10 feet in height or more can be seen with their lower leaves up to 5 feet or so all withered, and the higher ones untouched. Frosts again are very prevalent in sandy soils, which, although easily heated in the daytime, cool rapidly at night. A thick growth of grassy weeds also increases the danger from frosts by increasing the radiation of heat and consequent cooling of the surrounding air.

Among broad-leaved trees, beech, ash, sweet chestnut, and oak are very sensitive to frost, while sycamore and elm do not suffer very severely. Alder, birch, hornbeam, and most of the poplars are decidedly frost-hardy. Of the conifers, larch, spruce, silver fir, and the Oregon Douglas fir are very susceptible to frost; while Scots fir and Corsican and Austrian pines are hardy.

Timber Control.—It is officially announced that as the problems connected with the supply of timber have now only an indirect connection with the War Office, the War Cabinet have decided to transfer the Timber Supply Department from the War Office to the Board of Trade.

As the result of investigations, it appears that Douglas fir may be planted with confidence on soils overlying chalk, provided the top 12 inches or so is thoroughly disintegrated, and especially if the previous crop of hardwoods or underwood has left the surface rich in humus. The Douglas fir has

proved itself so valuable for the production of large masses of high-class timber in this country, that many think it should have a preference over most other trees for planting under any conditions which hold out a reasonable prospect of success. Hitherto planters have been dissuaded from the using of Douglas fir unless the soil to a depth of 4 to 5 feet was fairly free of lime, but, with the experience of this investigation no hesitation need be felt in forming plantations, even where solid chalk occurs within 2 feet of the surface, and where abundant lumps of chalk are met with even at a less depth.

Bog-land, or any land with a predisposition to slip and slide, may be fixed by draining and planting with those species having stoloniferous and binding root systems. Norway spruce is an excellent "drainer" in localities suited to it. On peats the Sitka spruce (*Picea sitchensis*) has been tried with success, notably in Scotland, and other trees which may be planted in such situations with prospects of success are *Pinus Pinaster* and Scots and Weymouth Pines. Alder will grow where there is the requisite moisture.

It is very unusual for the pine beetle to be found attacking the shoots of larch, or any conifer but the pine, and especially the Scots pine, but it is not unknown. The explanation that Mr. McLaren offers is no doubt the correct one. Alongside the larch plantation, on an adjoining estate, the wood of Scots pines was felled during the past spring, and the timber was left lying on the ground for some months. Here was ample opportunity for the pine beetle to breed in large numbers. About the month of August the young broods would appear, and in the ordinary course would have sought the leading shoots, or the shoots of side branches, of Scots pines, and have bored into them. As a matter of fact, Mr. McLaren reports that the few Scots pines mixed with the larch have had every shoot excavated, but these not sufficing to supply the food required by swarms of insects, the latter have been driven to attack a plant, namely, the larch, which under ordinary circumstances they leave alone.

On most well-managed estates there is some system in vogue for extending the life of the timber used in estate buildings and for fencing and other purposes. There are several methods used for this end, such as impregnating with naphthalene or painting with solignum, &c., but the most common one is that of creosoting with heavy creosote oil. There are three ways of creosoting: (1) By pressure—the most effective; (2) by immersing the timber in the liquid and boiling for some hours; (3) by simple cold immersion. The last is the slowest process of all and the least effective, for the creosote cannot penetrate to any extent, although, as it is very cheap, it may with advantage be used on farms and very small estates, where the expense of a more elaborate system would not be justified. The boiling method is the most commonly used on estates, for the cost of the steeping tank and heating apparatus is far less than that of the large air-tight cylinder and powerful pumps necessary for creosoting under pressure. It affords very good results with many species of timber, but in others there is not the thorough saturation of the outer tissues as in creosoting under pressure. The latter is the most effective method in use, although, incidentally, it is the most expensive *at the time*.

At the present time and for the past few years one of the most striking features in the district comprising North Bedfordshire and Huntingdonshire, from an arboricultural point of view, is the prevalence of diseased and unsightly ash timber, both hedgerow and otherwise. A sound and well-grown ash tree is now, comparatively speaking, a rarity in this part of the country, where ash is by no means scarce, practically all now standing being badly shaped trees past their prime, or leggy saplings in the spinnies.

Canker and malformations are woefully numerous, the damage being effected by *Nectria ditissima*, frost, bark-gnawing, and accidental wounds, or sometimes, in the case of hedgerow trees, from bark-scorching. Either of the last-mentioned calamities not infrequently seems to have been subsequently aggravated by the fungus named. The Goat Moth (*Cossus ligniperda*) has claimed an astonishing number of victims, and its larvæ have done widespread damage, for the ash appears to be their favourite host in this part of the country. It has also been observed with interest that the Green Woodpecker, though active, has confined its attacks solely to diseased or decayed trees.—*A. D. W.*

Forestry (*Trans. Roy. Scot. Arbor. Soc.*, Jan., July 1917).—The country has been informed that it is the intention of the Government to make every available acre of land productive. This can only be done with the aid of afforestation. There are, no doubt, thousands of acres of agricultural land, now neglected, which are capable of being profitably cultivated. But beyond these, there are millions of acres of waste land capable of being profitably planted.

Unless the Government will assist in planting them, one of the greatest natural resources of the country must remain undeveloped.

The benefits of national afforestation may be summarized as follows :—

1. It would turn many barren wastes into profitable woodlands.
2. It would retain, in the rural districts, thousands of men who now have to seek employment in the towns.
3. It would keep in this country, for the benefit of the country, millions of pounds now paid away to foreigners.
4. It would enable a large number of small holdings to be established on economic lines.
5. It would lead to the development of many new industries.
6. It would ensure such a supply of timber as would enable British industries to be carried on, without curtailment and without anxiety, in the event of another great war.

From a variety of reasons, conifers have become more and more the principal forest trees in temperate climates. As this tendency is likely to increase in the immediate future, it is becoming increasingly necessary that the diseases of coniferous trees should be understood. The Chermesidae are all enemies of coniferous trees, namely, spruce, larch, pine, silver fir, and in America, Douglas fir. The damage done by these pests is largely dependent on the vigour of the hosts. Thus, when the environment of the conifers is ideal, the damage done by the Chermes is not important, but the biological adaptations of the Chermesidae are such that the slightest diminution in the health of the trees means that these pests become serious enemies.

The most important matter connected with the rearing of plantations undoubtedly lies in the selection of suitable species for the margins, together with their after-management. Unless this important matter is carried out on sound principles, it is hopeless to expect any plantation to reach maturity and produce the best commercial timber. In fact, the whole life of the plantation, till it reaches maturity, may be said to be entirely dependent on the stability of the margins.

A great deal has been written on the varieties of trees which should be grown and the best methods of treatment; but seldom, if ever, has any reference been made to the formation and management of margins. Both in theory and in practice do we find that margins have been neglected. The trees forming these are generally the same species as are found in the interior of the plantation, and, what is often worse, the treatment meted out to them is often the reverse of what is required to train a substantial wind-screen.

It is generally found that the practice has been to thin the interior and leave the marginal trees close together, especially in exposed situations, in order that they may break the blast and give shelter to the interior. Under this treatment the trees become drawn-up, tall and slender, the side branches are destroyed, the trees become stunted in growth and covered with lichens, there is no room for root development, and, instead of forming a barrier to the wind, they are themselves laid low.

The lack of a good margin allows the wind to have full play underneath, so that the forest floor is swept clean for a considerable distance. The soil is thus robbed of that important part of a forest soil—a humus layer.

One of the outcomes of the war may be the recognition by the British mining industry of the possibility of its demands for pit-props being met by the use of home-grown timber. It would therefore appear desirable for producers to consider whether they can meet such a demand and the best method of maintaining a supply.

In the past practically the only marketable product of British woodlands has been mature timber. This means a rotation of at least sixty years, so that no individual lives to market the crop he has planted—a fact which has greatly retarded afforestation. While mature timber will still be in demand, and in all probability maintain its value, it seems quite possible by careful selection of site and genus to grow a crop of pit-wood which will give a good return in fifteen to eighteen years. The advantage of a short rotation to the grower is so obvious that no comment is needed, and its advantage to the nation by reducing payments to other countries for foreign wood is equally apparent.

It is believed that there are at least four different trees which can be grown in Britain that will give a crop of pit-wood in fifteen to eighteen years.

The study of the diseases incidental to coniferous seedlings, while of great interest to the plant pathologist, may be of the greatest practical value to the nurseryman and forester, especially when not only the cause is ascertained, but

when an appropriate remedy, and better still a means of prevention, can be suggested.

Fungi claim many victims in a close-grown spruce crop. For example, *Trametes radiciperda* seems to attack the healthiest and best-developed specimens. This fungus is always present in the plantations, and sporophores are freely produced in burrows, and on the sides of open drains. The spruce needle-rust (*Chrysomyxa Abietis*) is found in different localities here, but seems confined to old mature trees or stunted suppressed specimens. Alongside one of these mature infected spruces a small area was planted two years ago with five different species of *Picea*, but as yet no signs of susceptibility to this fungus have been shown. *Lophodermium macrosporum* is somewhat virulent on the needles of a pure spruce crop of thirty-eight years of age. The foliage of individual trees becomes quite red, and on shaking the tree the needles fall in showers to the ground. On many of the spruce needles the conspicuous black perithecia are present. A part of this wood was felled for pit-wood, and this disease was alarmingly prevalent. It had been the direct cause of the death of many flourishing trees.—A. D. W.

Foxglove, A Smooth-stemmed Form of the. By Miss E. R. Saunders (*Jour. Genetics*, vol. vii. pp. 215-228, May 1918).—Two forms of the common foxglove are known, both breeding true, the one with hairy grey stems, the other with green polished stems, pubescent only among the flowers. The latter form (*nudicaulis*) is dominant when crossed with the former (*pubescens*), and segregates in a 3:1 ratio in F₂. The glabrous form is thus probably the original, and the pubescent one has probably mutated from it. The rare occurrence of thickened sepal margins with structures resembling rudimentary ovules is noted, and pleiotropy and heptandry are noted as inherited independently and both recessive to the normal.—F. J. C.

Fragaria, A Further Note on the Genetics of. By C. W. Richardson (*Jour. Genetics*, vol. vii. pp. 167-170; May 1918).—Pink-flowered *Fragaria vesca* × white-flowered gave pink-flowered; these selfed produced 20 pink, 57 pale pink, 10 white (including 3 quite white) or nearly so. Double × single (both ways) gave singles segregated in about 3:1 ratio in F₂. Hairy stems and front of leaf appeared in F₂ *virginiana* × *chiloensis*, and in F₂ segregated into a 3 to 1 ratio. A few figures with regard to sex inheritance are also given.—F. J. C.

Garden, The Home, in the South. By H. C. Thompson (*U.S.A. Dep. Agr. Farm. Bull.* 647, March 20, 1915; plates).—A plea for more widespread cultivation of green food for their families by the cotton-growing community, for reasons of health, pleasure, and even of profit. It contains a body of information for the inexperienced on vegetable-growing, and gives a descriptive list of the vegetables most suitable and likely to succeed under the local conditions.—M. L. H.

Gipsy Moth in America, Food Plants of the. By F. H. Mosher (*U.S.A. Dep. Agr., Bur. Ent., Bull.* 250, July 24, 1915; 39 pp., 6 plates).—Describes laboratory experiments and field observations for the purpose of ascertaining what species of trees and shrubs are preferred as food by the gipsy moth. The trees and shrubs tested have been arranged in four classes, according to their susceptibility to attack. Among forest trees, oaks and birches predominate over much of the area infested, and these are specially susceptible. Among the horticultural crops most likely to be affected is the apple. In moderate infestations, arsenate of lead (10 lb. to 100 gallons of water) is recommended, applied as soon as the trees come into full leaf.—F. G. A.

Gipsy Moth Work in New England. By A. F. Burgess (*U.S.A. Dep. Agr., Bur. Ent., Bull.* 204, May 21, 1915, 32 pp.; 5 plates, 6 maps, 3 figs., 5 tables).—Field work, consisting of application of hand methods for controlling these insects, as well as inspection of plant products from the infested area, is to some extent preventing the spread of the gipsy moth, but, on account of the enormous area infested, it is impossible to cover much of the woodland. Experimental work, including introduction of parasites and natural enemies, together with careful studies of the food plants and other factors, has helped materially in decreasing the amount of infestation, and will probably become more potent in the future. The importance of bringing forest lands into a growth which is unfavourable to the development of the gipsy moth cannot be too strongly urged.—F. G. A.

Gladiolus, Hard Rot Disease of. By L. M. Massey (*U.S.A. Exp. Sta., Cornell, Bull.* 380; Sept. 1916; figs.).—The first symptoms of this disease are minute brown or purplish-brown circular spots on foliage usually in July or

August, finally becoming almost black. The older spots are limited by the veins. On the corms the spots are at first minute, usually on the lower, but sometimes also on the upper part of the corm, and seen only after removing the tunics. Later the centre of the spot becomes sunken, the tissue black, and the margin more definite. There is a distinct hardening of the tissues, so that they are difficult to cut with a knife. Plants grown from diseased corms are more or less stunted, often fail to flower, and quickly lose their leaves, which turn brown and die. The author found the fungus *Septoria Gladioli* Passer always associated with the disease, carried out inoculation experiments, and gives drawings of fungus and diseased tissues. Crop rotation, the planting of healthy corms only, and the destruction of diseased foliage and corms are the measures recommended.

F. J. C.

Hop Resistant to Mildew, On Forms of the. By E. S. Salmon (*Jour. Agr. Sci.* vol. viii. part 4, Dec. 1917, pp. 455-460).—The author has observed that two seedling hop plants raised from seed of the wild *Humulus Lupulus* procured from Italy were not attacked by Mildew (*Sphaerotheca Humuli*) when exposed with several hundred one- and two-year-old seedling hops under conditions extremely favourable to Mildew. All the other seedlings were infected. Subsequently a similar immunity was observed in the case of seven out of about one hundred and sixty seedlings, also raised from Italian seed of the wild plants and grown under conditions very favourable to Mildew. *Humulus Lupulus* in the wild state therefore comprises forms which may be either very susceptible or very resistant to attack by *S. Humuli*. Whether these forms are morphologically identical or not has not yet been determined. It may be that they are "biologic forms," such as have been observed among plants of *Spiraea Ulmaria*, *Epilobium montanum*, *Ranunculus repens*, &c.—J. E. W. E. H.

Huntleya citrina Rolfe (*Bot. Mag.* t. 8689; Dec. 1916).—*Orchidaceae* (Vandace). A plant from the collection of the late Sir Trevor Lawrence, native of Colombia. An epiphytic species with numerous pale-green distichous leaves 6 to 11 inches long. The solitary flowers are axillary, pale yellow, with a blood-red crest to the lip, and borne on pedicels about 2 inches long.—F. J. C.

Insect Metabolism, the Influence of Atmospheric Humidity on, Some Facts relative to. By Thos. J. Headlee, Ph.D. (*Jour. Econ. Entom.* x., pp. 31-38; Feb. 1917).—The author opens his paper by stating some known cases of the influence of atmospheric humidity on various stages of insect development; and goes on to give a detailed account of some experiments carried out with the bean weevil (*Bruchus obtectus* Say.), and the Angoumois grain moth (*Sitotroga cerealella* Oliv.). It is shown that air in which the humidity is kept low by H_2SO_4 may be so dry as to prevent the bean weevil from carrying out its life history or even entering the seed. A reference is given to a native method in Rhodesia of protecting maize from weevils by mixing it with finely powdered wood ashes, and it is also noted that a layer of wood ashes on the outside of the sack alone is effective. A layer of building lime on the floor of the storing place and between successive layers of bags gives satisfactory results; and it is suggested that whilst one would naturally attribute the results to the caustic effect of the ashes or lime, the fact that protection is secured, even when the substances are not in direct contact with the seed, may be due to the well-known hygroscopic properties of ashes and lime. The author suspects that here we have the practical application of the effect of low relative humidity.—G. W. G.

Insecticide, Quassia Extract as a Contact. By N. E. McIndoo and A. F. Sievers (*Jour. Agr. Res.* x. pp. 497-531; Sept. 1917).—A long paper detailing a large number of experiments and concluding that in general quassia extracts are not efficient insecticides, although solutions may be made which are effective against certain species of aphids.—F. J. C.

Irises of June, The Garden. By G. Dillistone (*Gard.* July 21, 1917, p. 286).—This article contains a useful review of Garden Irises flowering in June, particularly of some of the new varieties.—H. R. D.

Juniperus Cedrus. By G. V. Perez (*Jour. Soc. Nat. d'Hort. France*, Jan. 1917).—An account of the cultivation of this rare native of the Canaries.—F. J. C.

Kelp, Potash from. By K. Cameron (*U.S.A. Dep. Agr., Bur. of Soils, Bull.* 100; 40 plates, 33 tables).—A comprehensive description of the kelp beds of the United States, the method of harvesting from same, and the preparation of potash salts with the residue of valuable by-products.

Some idea of the value of this work may be obtained from the heading of one of the tables, comprising such items as Latitude, Longitude, Kind, Density of Bed, Size, Area, Tonnage, Nearest Shipping Points, Anchorage and Shelter. One of the sections in Western Alaska is estimated to produce 80,300 tons of potassium chloride.—C. P. C.

Kerria japonica, A Twig and Leaf Disease of. By V. B. Stewart (*Phytopathology*, vii. pp. 399-407, Dec. 1917; figs.).—Small discolored areas of a reddish-brown colour are produced on leaves which later become yellow, shrivel, and fall prematurely. Similar spots occur on the shoots, and frequently the bark dries up on these spots and falls away, sometimes to such an extent that the twig is girdled. The fungus involved appears to be a new species which is described as *Coccomyces Kerriae*.—F. J. C.

Lagenaria oleifera. By R. de Noter (*Le Jard.* vol. xxxi. pp. 190, 191; 1 fig.).—It is proposed to cultivate this gourd as a source of oil. With plenty of manure and water it would succeed in the south of France or Algeria. Each gourd weighs about 50 lb. and is full of seeds, from which the oil is expressed; 12 lb. of oil are obtained from each gourd. The residue forms a valuable food for cattle.—S. E. W.

Lemon-grass Oil, Possibility of Commercial Production of, in the United States. By S. C. Hood (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 442, Jan. 25, 1917, 12 pp.; 3 figs., 6 tables).—A volatile oil distilled from *Cymbopogon citratus* DC., commonly called lemon-grass, used in the perfume and soap industries. The climatic requirements are subtropical; it is chiefly produced in India and Ceylon. Experiments have been made in Central Florida, and it is believed that the crop would yield favourably if grown in connexion with other volatile oil plants. With lemon-grass alone, the distilling plant would be in use during only a few weeks in the year. The bulletin gives details of culture, distillation, &c. F. G. A.

Lilies in July. By J. W. B. (*Irish Gard.* xii., Aug. 1917, p. 126).—Interesting notes on Lilies blooming in the month of July.—E. T. E.

Lilium Parkmanni. By P. S. Hayward (*Gard.* Sept. 1, 1917, p. 359; fig.).—Well-nigh half a century ago Mr. Parkman, an American, raised *L. Parkmanni*, a grand hybrid between *L. auratum* and *L. speciosum*, and it is a pity such a noble plant should be lost.

This season the author flowered the new hybrid, which is a successor to *L. Parkmanni* between *L. speciosum* and *L. auratum*. It carries the size of *L. auratum platyphyllum* and its fragrance with the finest *L. speciosum* colouring. The seed was sown in 1914, and from present appearances it gives the impression of a first-class constitution.

The editor appends a note of the history of *L. Parkmanni*.—H. R. D.

Lilium pseudo-tigrinum. Anon. (*Irish Gard.* xii., Oct. 1917, p. 150).—A very desirable new Chinese species.—E. T. E.

Lime as an Insecticide. By Z. P. Metcalf (*Jour. Econ. Entom.* x., pp. 74-78; Feb. 1917).—This paper gives an account of experiments carried out for the purpose of finding a control for the pea and bean weevils (*Bruchus chinensis* Linn. and *B. quadrimaculatus* Fabr.). Carbon-bisulphide in large doses, paraffin, and crude carbolic acid did not give at all satisfactory results; but the use of air-slaked lime was successful.

The article is accompanied by plates illustrating cow-peas untreated and treated with various quantities of lime. Farmers are advised to store their seed peas in air-slaked lime at the rate of one part lime to two parts peas by weight, until something cheaper can be found. It is not necessary thoroughly to incorporate the lime with the seed in order to secure protection. In these experiments it was simply poured over the seed previous to bagging (see Abstract on Insect Metabolism).—G. W. G.

Lime Sulphur Solution. By A. A. Ramsay (*Aggr. Gaz.* N.S.W. vol. xxx. pp. 210-211).—There is an essential difference between lime sulphur and self-boiled lime sulphur solutions. Only a small proportion of lime and sulphur enter into chemical combination in the self-boiled solution, and the chief product of the reaction is calcium thiosulphate, which has small fungicidal value. The sulphur in suspension is probably the active ingredient. In the lime sulphur solution, 91 per cent. of the lime and sulphur go into solution. Most of the sulphur is present as polysulphide.—S. E. W.

Limestone Tester, A. By C. G. Hopkins (*U.S.A. Exp. Stn., Ill., Civ.* 185, Feb. 1916).—It describes a simple apparatus for testing the purity of the various limestone rocks, much used as ground limestone for improving soils.

A table is printed showing the weight of carbon dioxide at various temperatures and barometer readings to be used in calculating the amount of calcium carbonate present in tested sample.—C. P. C.

Locust in Cyprus, The. By W. P. D. Stebbing, F.G.S. (*Ann. Appl. Biol.* vol. iv. No. 3, Dec. 1917, pp. 119-122).—Describes the methods since the British occupation in 1878 of combating the locust ravages in Cyprus. Before that date no attempts were made to solve the problem of preventing attacks. Among the most useful natural enemies are birds and lizards. The successful methods are: 1. Egg-collecting by digging up the egg-masses, always laid in light soil bordering fields. 2. Stopping the crawling larval hosts by trenches, on the further side of which were screens topped with strips of American cloth. They were unable to surmount this obstacle and fell back into the trench, to be suffocated by the oncoming larvae. 3. Sprinkling feeding areas with a bacteria cultivation, causing an outbreak of epidemic disease among them.—R. C. S. R.

Maize, Varieties of. By H. Wenzholz (*Agr. Gaz. N.S.W.* vol. xxviii. pp. 635-644, and 685-693; 13 figs.).—The following varieties of maize are officially recommended for cultivation in New South Wales: 'Leaming,' 'Yellow Dent,' Reid's 'Yellow Dent,' Funk's 'Yellow Dent,' 'Early Yellow Dent,' 'Red Hogan,' 'Boone County White,' 'Hickory King,' 'Silver Mine,' and 'Early Clarence.' The illustrations show the general growth, and the ears of the different varieties.—S. E. W.

Mealy-Bugs, Methods for the Study of. By G. F. Ferris (*Jour. Econ. Entom.* x., pp. 321-325; June 1917).—The author criticizes the use of the so-called antennal formulæ (i.e. the relative lengths of the segments of the antennæ) and the supplementary characters usually given—as totally inadequate and in fact misleading as specific criteria. He then details a means of staining specimens in order to accentuate characters that are said to be of essential importance. The specimens to be prepared are boiled in caustic potash in the usual manner and then removed, and the bodies washed out in clear water. They are next transferred to a one-half or a one-third strength magenta-red solution and left six hours. Finally the excess stain is removed by washing in 95 per cent. alcohol and the specimens placed for an instant in carbol-xylene and mounted in balsam. The method is equally applicable to insects other than coccids and has been found eminently satisfactory for certain aphides, particularly *Chermes* and *Phylloxera*, and with the larvæ of *Cecidomyiidae*.—G. W. G.

Meconopsis nepalensis var. elata. By B. (*Irish Gard.* xiii. p. 103, July 1918; 1 fig.).—A handsome plant bearing large clear yellow flowers. Height, 3-4 feet. Basal leaves up to 15 inches long of greyish appearance, due to yellowish down interspersed with long soft hairs. Anthers deep orange. Quite distinct from *M. paniculata*. Soil, moist peat, as for *M. Prattii*. Flowering period, June. E. T. E.

Meconopsis Prattii. (Anon.) (*Irish Gard.* xiii. p. 103, July 1918; 1 fig.).—A beautiful new Chinese species similar to *M. racemosa*. Flower scapes 2-3 feet high, flowers deep blue, basal leaves up to 1 foot long. White anthers; soil, moist peat. Flowering period, June.—E. T. E.

Melon 'Petit Nantais.' By Vivet (*Rev. Hort.* vol. xc. pp. 136-137; 1 col. plate).—The Melon 'Petit Nantais' is a hardy plant resulting from crossing 'Orange' with 'Petit Prescott.' It excels its parents in flavour and in the colour of its fruit.—S. E. W.

Melon Seeds (*Rev. Hort.* vol. xc. p. 110).—New melon seed yields vigorous plants with numerous male flowers and not many female. The plants raised from old seed are less vigorous and produce many female flowers.—S. E. W.

Mexican Apple. By E. N. Ward (*Agr. Gaz. N.S.W.* vol. xxix. pp. 134-136; 2 figs.).—The Mexican Apple (*Casimiroa edulis*) flowers in spring and autumn, bearing flowers, immature and ripe fruit on the same branch. The fruit is as large as a medium-sized apple with a stone like an almond. The flavour is delicious, and contrary to popular belief no ill-effects were produced by eating the fruit.—S. E. W.

Mottling, Composition of Citrus Leaves at Various Stages of. By C. A. Jensen (*Jour. Agr. Res.* ix. pp. 157-166; May 1917).—An examination of the chemical composition of mottled orange leaves, leading to the conclusion that the mottling is not due to deficiency in any of the chemical elements usually required by plants. (See also 'Citrus.')—F. J. C.

Myzus ribis (Linn.), The Migratory Habits of. By C. P. Gillette and L. C. Bragg (*Jour. Econ. Entom.* x., pp. 338-340; June 1917).—This is one of the best-known aphides. It occurs on various species of *Ribes*, more especially the common red currant. It has long been known that many of the aphides leave the currant bushes during the summer; and the authors state that they have repeatedly successfully transferred migrants from *Ribes* to *Stachys* and *Leonurus*, and the autumn migrants from these plants to the currant. They feel safe, therefore, in announcing these two genera, at least, as summer hosts of *Myzus ribis*.
G. W. G.

Nicotine Sulphate, a Neglected Factor in the Use of. By W. Moore and S. A. Graham (*Jour. Agr. Res.* x. pp. 47-50, July 1917).—The authors report illness due to eating of lettuce sprayed twelve days before with a nicotine wash. Nicotine itself is very volatile and no harm will follow the use of plants sprayed with it twenty-four hours before, but nicotine sulphate is non-volatile and should not be used in spraying greenhouse plants which are to be eaten later. The lime, &c., in hard waters indirectly brings about the volatilization of nicotine from nicotine sulphate, and the authors recommend that washes containing nicotine sulphate should be made alkaline with soap, &c., before use.—F. J. C.

Nicotine Sulphate as a Poison for Insects. By A. L. Lovett (*Jour. Econ. Entom.* x., pp. 333-337; June 1917).—An account is given of some experiments with nicotine sulphate as a stomach poison for insects. Tent caterpillars (*Malacosoma plumalis*) were placed on foliage sprayed with "Black Leaf, 40" 1-1200, after the leaves had dried. In this as in the other experiments the spray had an extremely nauseating effect on the caterpillars causing many of the larvæ to fall from the foliage and lie as dead for some hours, eventually recovering and crawling away. Where any feeding took place the larvæ were killed. The general conclusions reached are:—

1. Nicotine sulphate is a very powerful repellent to caterpillars.
2. Caterpillars will not ordinarily feed from choice on foliage sprayed with comparatively weak solutions; but when they do so, even small portions of leaves are sufficient to kill.

Nicotine sulphate as a contact insecticide is usually considered a very efficient but expensive spray. It is pointed out that, in view of the possibility of its wider insecticidal properties, this conception may yet be considerably modified.—G. W. G.

Onion. By A. F. Pearson (*Irish Gard.* xiii., Feb. 1918, pp. 29-30).—A useful cultural article.—E. T. E.

Onion Fly, Poisoned Bait Spray against. By H. H. P. Severin and H. C. Severin (*Jour. Econ. Entom.* 8, pp. 342-350; June 1915).—The life-history of the well-known onion fly (*Phorbia cepetorum*) is detailed and an account given of its ravages. It is stated that seventy methods of control have been proposed, but that a poisoned bait spray has not been used. The authors experimented with a spray to be applied before the fly lays its eggs, composed of molasses $\frac{1}{2}$ pint, sodium arsenite (dissolved in boiling water) $\frac{1}{4}$ oz., water 1 gallon. They found the flies were attracted by this spray, which need therefore not be applied so as to cover the whole plant, but there is considerable danger of the material being washed off by spring rains and also of the foliage being burned, while invasions from neighbouring gardens would render the frequent repetition of the spraying necessary.—F. J. C.

Onion-growing. Is it worth while? By Douglas Newton (*Jour. Bd. Agr.* vol. xxix. No. 12; March 1918).—A five-page article giving facts and figures in connexion with onion-growing on a commercial scale. Figures given for 1915 crop show a loss, but in 1916 and 1917, owing to high prices of the crop, substantial profits were made, notwithstanding the high costs of cultivation. Brief notes on soil, previous crop, seed, labour, manuring, and storage are given, and the author concludes that owing to exigencies of shipping situation home-grown onions will pay for some years to come, as we are faced by a shortage of some millions of bushels of onions.—G. C. G.

Onions and Gherkins, Pickling (*Agr. Gaz. N.S.W.* vol. xxviii. p. 577).—To retain the white colour of onions when pickled proceed as follows. Pour hot water over the small onions to facilitate the removal of their skins. As they are skinned place them in strong brine. After twenty-four hours renew the brine and repeat this operation next day. On the following day put the onions in fresh water and heat them to the boiling point, stirring frequently. Milk added to the water helps to whiten the onions. Drain well, place the onions in a jar and pour boiling vinegar over them. No spices must be added, if the white colour is to be retained. To retain the green colour of gherkins, let 200 gherkins stand all night in water to which a pint of salt has been added. Drain off the water and replace by vinegar in which parsley has been steeped for some days. The vinegar is boiled with one ounce of cloves, one ounce of allspice, and a piece of alum the size of a walnut. The boiling vinegar is poured over the gherkins, and the pickles covered with green cabbage leaves. The addition of a few green peppers is a great improvement.—S. E. W.

Onions, Neck Rot Disease of. By M. T. Munn (*U.S.A. Exp. Sta. New York, Bull.* 437, pp. 363-455, July 1917; 11 plates).—This disease is commonly met with in the chief onion-growing districts of Michigan and New York States, and in many other districts where onions are stored. In the case of stored onions the disease appears as masses of sclerotia, black in colour, while in other cases the fungus forms a dense mass of grey mould. The causal organism is *Botrytis Allii*, and infection may take place through the bulbs and the leaves. The fungus produces an appreciable amount of oxalic acid and secretes the enzyme pectinase. This may be extracted, and from a study of its action it is possible to explain all the tissue changes which take place in the host.

The factors favourable to infection are immaturity and imperfect curing of the bulbs; mistakes in applying manures; humidity and heat in the storing-house. The methods of control lie mainly in field sanitation, and care of the stored crop in suitable houses at proper temperatures.—A. B.

Orange Oil from Waste Oranges. By S. C. Hood and G. A. Russell (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 399, Dec. 16, 1916, pp. 1-12; 5 figs., 5 tables).—Describes the method of extracting sweet-orange oil. The yield of pressed oil from 100 lb. of waste oranges is estimated at 4 to 5 oz., giving a net return of 32 to 44 cents.—F. G. A.

Orchard Costs and Methods. By C. G. Woodbury and others (*Agr. Exp. St., Purdue, Bull.* 194, pp. 77; 55 figs.).—Deals with all phases of the treatment of established orchards, with special reference to the profit side of these matters. E. A. B.

Orchard Enemy, The Parandra Borer as an. By F. E. Brooks (*U.S.A. Dep. Agr. Bull.*, July 1915).—The most important means of preventing injury to trees by the Parandra borer is the keeping of the trees in such a condition of soundness that the beetles will not deposit eggs in them. The entrance of the borer into the tree is first made where dead wood is exposed by the removal or decay of bark following mechanical injury or disease. If the exposure of dead surfaces can be prevented, the danger of attacks from this borer will be eliminated. Injury to the trunks or larger branches of fruit trees, affording favourable places for borer attack, result from a variety of causes, some of which at least are easily preventable. The practice of leaving stubs six inches or more in length in pruning out large branches is quite likely to result ultimately in injury from this insect. The stubs left are practically sure to die back to the trunk and from a decayed spot or cavity that is exactly to the liking of the beetle as a place in which to oviposit. Instead of leaving such stubs when removing large branches, the cut should be made near to the trunk where the natural swell at the base of the branch will insure healing to be most rapid. The cut surface should then be covered with a heavy coat of white lead or some similar paint.

Whenever borers of this species gain entrance to a tree there is only one practical way of removing them, and that is to gouge or chisel out all the wood through which their burrows extend. The cavity should then be properly cleaned and disinfected and filled with cement. Wherever the borers are present at all they are likely to occur in considerable numbers, and it is their habit in feeding to scatter about through the wood so much that little can be accomplished by attempting to remove them with a knife and wire, as is often done with some other species of fruit-tree borers.

In chiselling out the borers preparatory to using cement, all the punctured wood and all the wood soaked with water or affected by decay or disease should

be removed. The interior of the cavity should then be sterilized by applying creosote with a brush, after which it should be painted with a heavy coat of coal-tar. The cavity should then be filled compactly with a mortar made of one part of a good grade of Portland cement and three parts of clean sharp sand.—A. D. W.

Orchids in the Open. By L. Cezard (*Rev. Hort.* vol. lxxxix. p. 360, and vol. xc. p. 34).—Orchids usually grown in temperate or cool houses may in many cases be grown out of doors if they are given a south aspect and protected from the wind by a wattle fence or screen of bamboos or young hornbeam. A light covering is necessary to guard against hailstorms. The following gave good results: *Epidendrum vitellinum*, *Cattleya Mossiae*, *C. Mendelii*, *C. Gaskelliana*, *C. Trianae*. They require plenty of light and a dry atmosphere. The temperature should not fall below 40° F. *C. intermedia*, *C. Harrisoniae*, resist damp better than the above. *Laelia anceps*, *L. autumnalis*, *L. praestans*, *L. cinnabarina*, *L. harpophylla* are less difficult to grow. *Dendrobium thyrsiflorum* and *D. Wardianum* require moist heat during their period of growth. *D. nobile* is less exigent in this respect. *Vanda Amesiana*, *V. Kimballiana*, *V. tricolor* can be grown with the *Cattleya* and *Dendrobium*. *V. coerulea* is the most beautiful and flowers freely but cannot endure cold damp. *Coleogyne cristata* grows easily, but is uncertain in flowering. *Miltonia Clowesii*, *Odontoglossum grande*, *O. pulchellum*, *Oncidium incurvum*, *O. concolor*, *O. cristum*, *O. Marshallianum*, *O. leucochilum*, *O. Wentworthianum*, *O. Rodgeri*, *O. Sarcodes*, *Brassia verrucosa* are cultivated like the *Cattleya* but need more water. Most of the *Cypripediums* are of easy cultivation. They require a fibrous compost and protection from the direct rays of the sun. This also applies to *Angulica Clowesii*, *Cymbidium Lowi*, *C. Tracyanum*, *Lycaste Skinneri*, *Sobralia warrenii*, and *Disa grandiflora*. The two last must have copious watering.—S. E. W.

Palms, Transplantation of. By A. R. Proschowsky (*Rev. Hort.* vol. xc. pp. 139, 140).—The method of transplantation, in which the trees are previously deprived of their roots and leaves, gave good results in the case of *Phoenix canariensis*, *Chamaerops humilis*, *Washingtonia filifera*, and *W. robusta*.—S. E. W.

Parasite Eelworm on Potatoes and Cotton. By N. A. Cobb (*Jour. Agr. Res.* vol. xi. No. 1, Oct. 1917, pp. 27-33; 5 figs.).—The author describes a new nematode parasite (*Tylenchus penetrans* n.sp.) which has been discovered infesting the tubers of the potato, the feeding roots of camphor, the root-stocks of violets, and the roots of cotton.

The external symptoms are the presence of spots or sunken areas upon the roots or tubers of the attacked plants; each area when fully developed contains a number (up to 50) of *T. penetrans* in various stages of growth. The disease has been found in widely separated districts under different climatic conditions and in widely diversified hosts, so that it appears reasonable to assume that this species of nematode can adapt itself to widely varying conditions. The presence of this nematode in potato is significant, and points to the great care necessary to plant healthy tubers only, if prevention of this disease is desired.—A. B.

Parsnips. By Andrew F. Pearson (*Irish Gard.* xiii., Jan. 1918, pp. 4-5).—A practical and valuable article on the entire culture of this vegetable, which has come to the front so much since 1914.—E. T. E.

Parsnips, Diseases of. By A. D. Cotton (*Kew Bull.* April 1918, pp. 8-21; figs.).—An account of the canker of parsnips is given, and the author concludes, as the result of experiments with manures and attempted infection, that it is not due to the attack of any specific organism. It is occasioned in the first place by cracking following rain after a period of drought. The parsnip cannot produce wound cork, and various pests find an easy entrance into the root and cause extensive damage. Several other diseases were met with in the course of the investigation, some of them being new to Britain, and including attacks of *Erysiphe Polygoni*, *Phyllachora Pastinacae*, *Ramularia Pastinacae*, *Cercospora Pastinacae*, and *Plasmopora nivea*.—F. J. C.

Peach Bacterial Spot in Southern States, The Control of. By John W. Roberts (*U.S. Dep. Agr., Bur. Pl. Ind., Bull.* 543, 1917, pp. 1-7).—The peach bacterial spot (*bacteriosis*), caused by *Bacterium pruni*, occurs in nearly all the peach-growing districts of the United States. It is particularly serious in the Southern States. The bacterium also causes a disease of the plum, Japanese varieties being chiefly affected.

All parts of the plants may be attacked, but the most serious injury is to the leaves.

The author suggests that the disease may be checked by proper pruning, cultivation, and fertilization. Nitrate of soda is particularly useful as a fertilizer. Trees in normal health and vigour are resistant to the disease.—A. B.

Peach, Improved Fructification. By H. Blin (*Le Jard.* vol. xxxii, p. 248).—An annular incision at the base of the branches of the Peach tree, immediately below the fruit, increases the weight of the crop, and advances the ripening of the fruit by at least a week. The incision is made when the trees begin to flower. The process succeeds in warm climates.—S. E. W.

Peanuts. By W. D. Kerle (*Agr. Gaz. N.S.W.* vol. xxix, pp. 137-142, 262-273, 338-343; 14 figs.).—The Peanut is an annual, thriving in districts which are suitable for maize. The crop is susceptible to frost, and should not be planted too early. One acre of ground should receive 88 lb. of superphosphate, 62 lb. of potassium sulphate, and 15 lb. of ammonium sulphate, or 22 lb. of dried blood. Peanuts are largely used in the manufacture of confections and food products. They are rich in oil, and the yield of oil is richer in tropical climates than in temperate zones.—S. E. W.

Pear Aphis, The Woolly (*Eriosoma pyricola*). By A. C. Baker and W. M. Davidson (*Jour. Agr. Res.* x, pp. 65-74, July 1917; plates).—This species forms galls on the roots of the pear, and passes the summer in galls on the foliage of the elm. Full descriptions are given, and the authors believe the species to have been introduced from Europe to the States and found it to be capable of living on the American as well as the European elm. They suspect it to be identical with *E. lanuginosa*.—F. J. C.

Peas. By A. F. Pearson (*Irish Gard.* xiii., March 1918, pp. 33-35).—A cultural article, dealing with pea cultivation, pests of peas, and so on.—E. T. E.

Peas for Poor or Shallow Soils. By F. R. Castle (*Gard.* May 5, 1917, p. 155).—The author considers the selection of varieties to be important and recommends the following:—

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| Essex Star | Royal Salute |
| Duke of York | Glory of Devon |
| Triumph | Dr. McClean |
| Senator | Knight's Ever-bearing |
| Rentpayer | Autocrat |
| Eureka | Late Queen |

which have been selected from a trial of over thirty varieties all sown on the same date upon soil of the poorest possible nature. The height of the varieties mentioned rarely exceeds 4 feet.—H. R. D.

Peppermint and Spearmint. By W. van Fleet (*U.S.A. Dep. Agr., Farm. Bull.* 694; Oct. 10, 1915).—There are two varieties of peppermint cultivated in America, the so-called white and black mints. The white variety yields the finest quality of oil, but the plant is less hardy and productive than the black mint and is now little cultivated in the States.

Peppermint-growing has spread widely in America, and many thousands of acres are under the crop.

Both peppermint and spearmint thrive best in deep soils rich in humus and retentive of moisture, but fairly open in texture and well drained either naturally or artificially.

These conditions are frequently combined in effectively drained swamp lands, but the plants may also be commercially cultivated in well-prepared upland soils, such as would produce good corn, oil, or potatoes.

This bulletin gives instructions for culture in such upland soils and also in what are known in America as muck land, that is, those broad level areas, often several thousand acres in extent, of deep fertile soil, the beds of ancient lakes and swamps where the remains of ages of growths of aquatic vegetation have accumulated. In Michigan and Indiana, where there are large areas of such land susceptible of thorough drainage, mint culture has become highly specialized, a considerable part of the acreage being controlled by a few well-equipped growers able to handle the product in an economical manner.

Mint culture on suitable soils seems to give fair average returns when intelligently conducted from year to year. The product is, however, liable to

fluctuation of price, and is likely to suffer from over-production if the acreage is too rapidly extended. The cost of establishing the crop and the annual expenses of cultivation are high.—*M. L. H.*

Perennials Attacked by *Sclerotinia Rolfsii*. By Geo. L. Peltier (*U.S.A. Exp. Stn. Illinois, Cir.* 187, July 1916).—In the summer of 1915 large numbers of perennials were found to be attacked by a fungus, *Sclerotinia Rolfsii* (Sacc.), which hitherto was confined to the more Southern States. Usually the first indication of the disease is a yellowing and drooping of the leaves of the attacked plant. The fungus attacks the plant on the stem just above the ground and soon spreads to the roots, finally causing a soft rot of all the parts underground. Sclerotia are soon developed and resemble mustard or radish seed in appearance.

Amongst the perennials attacked were the following: *Campanula Medium*, *C. persicifolia*, *C. carpatica*, *C. nobilis*, *Erigeron glabellus*, *Dianthus plumarius*, *Dracocephalum argenteum*, *Penstemon pubescens*, *P. Murrayanus*, *Phlox subulata*, and *Eupatorium ageratoides*. Of these the Campanulas were the most susceptible, especially *C. Medium*.—*A. B.*

Persimmon, The Native. By W. F. Fletcher (*U.S.A. Dep. Agr., Farm. Bull.* 685, Oct. 12, 1915; pl.).—The Persimmon is indigenous in the S.E. quarter of the United States; and the presence of single specimens in Rhode Island and Michigan show that the northern limit of its cultivation could quite well be extended.

The high food value of the fruit is not sufficiently appreciated. Masses of the crop go to waste for want of knowing how it may be used. Attempts to improve upon existing varieties by cross-breeding have also not been completely successful because one essential factor has been overlooked.

The Persimmon is generally dioecious, the pollen being distributed by bees and by the wind. In attempting to improve upon native varieties by crossing, the characteristics of the pollen-bearing parent should be also studied, and such parent should be selected among trees grown from seed produced by the most desirable fruit-bearing trees.

Various methods of cultivation and of propagating are here described, and the few diseases of the Persimmon are described. The wood is used for bobbins in cotton-mills, and the fruit is a valuable food for man and beast. Its intense astringency disappears when the fruit is fully ripe, but, as heat appears to make this astringency more apparent, an antidote in the form of half a teaspoonful of carbonate of soda should be added when the fruit is cooked. Recipes are given, and descriptions of some of the better-known varieties.—*M. L. H.*

***Picea bicolor*.** By Professor Henry (*Irish Gard.* xiii., Feb. 1918, pp. 17-18; 2 figs.).—*E. T. E.*

Pine Bark Beetle. By W. A. Clemens (*U.S.A. Exp. Stn., Cornell*, October 1916).—The genus was formerly known as *Tomicus*, but the synonymy according to Swaine (page 77 of reference cited) gives the name *Ips* De Geer (1775) priority. The species was described by Say (1827).

It is common and widely distributed, inhabiting the transitional and Canadian faunal zones from the Pacific to the Atlantic and from about 37° to 55° N.

Removal of the bark will cause the death of all larvæ and pupæ of the pine bark beetle. If a little care is taken in the removal and the bark is burned immediately, a large number of the adults may also be destroyed. Removal and burning of the bark in winter where adults are known to be in hibernation will do much to lessen attacks in the season following. Where water is available the placing of newly felled logs in the water will prevent injury by the beetles.
A. D. W.

***Pisum sativum*, Bacterial Disease of.** By Dorothy M. Cayley (*Jour. Agr. Sci.* vol. viii, part 4, Dec. 1917, pp. 461-479; pl. 7).—This is a report of further investigations of a bacterium for which the author proposes the name *Pseudomonas sativum*. The organism is a motile, sporing, facultatively anaerobic bacillus, capable of growth on acid, neutral, and alkaline media. It is found in large numbers in the tissues of the cotyledons of the Pea. A discoloured patch in the centre of the cotyledons is typical, but it is not possible to tell from the exterior of the seed whether it is or is not infected. From the cotyledons the infection spreads to the tissues of the stem and leaves. In mild cases the shoot may develop normally, but later the stem turns slightly brown and looks somewhat water-soaked. In bad cases either the seed does not germinate or the plumule and radicle show brown streaks and growth is limited. The organism can penetrate uninjured tissues from the outside only when they are very young.

Details of morphology are given. Attempts to find an immune variety have been unsuccessful, but the taller of the early varieties of peas show considerably less disease than the later varieties. So far no cure is known, but attention to rotation, early sowing, adequate drainage, sufficiency of lime in the soil, and burning of diseased haulm are recommended. The disease is a serious one, and appears to be on the increase.—*J. E. W. E. H.*

Plums, Cherries, and Apples, Report on Tests of Self-sterility of. By I. Sutton (*Jour. Genetics*, vol. vii. pp. 281-300, Aug. 1918; plate).—Trials carried out by various observers at the John Innes Institution indicate that of Plums—'Coe's Golden Drop,' 'Coe's Violet,' 'Crimson Drop,' 'Jefferson,' 'Bryanston Gage,' 'McLaughlin's Gage,' 'Early Green Gage,' 'Old Green Gage,' 'Reine Claude d'Altham,' 'Pond's Seedling,' 'Wyedale,' 'Frogmore Orleans,' 'Late Orleans,' 'Prune d'Agen,' 'Primate,' and 'Frogmore Damson' are self-sterile; 'Rivers' Early Prolific,' 'Early Favourite,' 'Cox's Emperor,' 'Early Orleans,' and 'Farleigh Damson' are partly self-sterile; 'Denniston Superb,' 'Early Transparent,' 'Reine Claude Violette,' 'Golden Transparent,' 'Reine Claude Bavay,' 'Oullin's Golden Gage,' 'Belle de Louvain,' 'Monarch,' 'Prince Engelbert,' 'Prune Géante,' 'Gisborne,' 'Victoria,' 'Pershire,' 'Yellow Magnum Bonum,' 'Early Mirabelle,' 'Kyröbala Red,' and 'Belgian Purple' are self-fertile. Self-fertile cherries include 'Amber Heart,' 'Black Eagle,' 'Black Heart,' 'Black Tartarian,' 'Biggareau de Schrecken,' 'Noir du Guben,' 'Napoleon,' 'Jaboulay,' 'Frogmore Early,' 'Early Rivers,' 'Elton,' 'Governor Wood,' 'Guignee d'Annonay,' 'Kentish Red,' 'Toussaint,' 'Waterloo,' 'White Heart,' 'May Duke' and 'Archduke' are partly self-fertile; 'Flemish Red,' 'Late Duke,' and 'Morello' are self-fertile. Of apples at the Institution, 'Beauty of Bath,' 'Cox's Orange Pippin,' 'Gascoyne's Scarlet,' 'Lane's Prince Albert,' 'Norfolk Beauty,' 'Northern Greening,' appear self-sterile; 'Worcester Pearmain,' 'Bramley's Seedling,' 'Lord Hindlip,' 'Lady Sudeley,' 'Old English Broadleaf,' 'Doucain,' 'Improved Doucin,' 'Pyrus prunifolia,' 'P. baccata,' 'Golden Russet,' partly self-fertile; and 'Antonowka,' 'Annie Elizabeth,' 'Baldwin,' 'Celline Pippin,' 'Coronation,' 'Duchess of Oldenburgh,' 'Golden Spire,' 'King of the Pippins,' 'Lord Derby,' 'Red Winter Reinette,' 'Ribston Pippin,' 'Stirling Castle,' 'Sturmer Pippin,' 'Washington,' 'French Paradise,' and 'Crimson Bramley,' self-fertile.—*F. J. C.*

Plums, Winter Aspect of Buds. By E. A. Bunyard (*Gard. Chron.* Jan. 19, 1918, p. 23, with fig.).—Calls attention to a useful method of recognizing certain varieties from leafless.—*E. A. Bd.*

Potato, A New Strain of *Rhizoctonia Solani* on. By J. Rosenbaum and M. Shapovalov (*Jour. Agr. Res.* ix. pp. 413-420; June 1917; plates).—Two "strains" of *Rhizoctonia Solani* have been isolated from the Potato, the new one discussed by the authors producing more pronounced lesions than the better-known one, both upon injured stems and tubers, and may, furthermore, be distinguished by its reaction, growth, and the character of the sclerotia on different media, and by the measurements of its cells.—*F. J. C.*

Potato, "Blackleg" of the. By S. G. Paine (*Journ. Agr. Sci.*, vol. viii. part 4, Dec. 1917, pp. 480-494).—The two recognized bacterial diseases of the potato in this country are "Blackleg" and "Brown Rot." At present they cause a loss of not more than 5 per cent. of the Potato crop of Great Britain, but there are signs that they are on the increase, and it is possible that they may become as serious pests with us as in Canada and Galicia. The author has made a thorough investigation of the organism which causes "Blackleg." This disease usually appears in June. The symptoms are wilted and yellow leaves, which later turn almost black. The stem at the ground level shows a blackened area, and if gently pulled leaves the soil with hardly any resistance. There is an almost entire absence of development of the tubers unless infection has taken place late in summer. In that case the tubers are infected, the vascular ring being seen to be stained brown. The propagation of the disease is due as a rule to the planting of diseased sets, and this accounts for the fact that the disease makes its appearance in isolated individuals and is but rarely found to be affecting even small patches. It is thought, however, that the disease may be sometimes introduced from the soil into the plant by biting insects.

The author shows that the organism which produces "Blackleg" of the potato is *Bacterium atrosepticum* (van Hall), and that it is identical with the organism which produces the disease in Ireland, and has been described by Pethybridge and Murphy under the name of *B. melanogenes*.

As regards control, the planting of healthy seed tubers is obviously of great importance. It has also been noticed (in one instance only, however) that a

plot of shallow-planted tubers showed a much higher percentage of diseased plants. Deep planting may therefore exercise a deterrent influence on the Bacteria.—J. E. W. E. H.

Potato Blackleg Disease. By W. J. Morse (*Jour. Agr. Res.* viii, pp. 79-126, Jan. 1917).—This disease is prevalent in certain seasons in Great Britain, and is characterized by a pronounced blackening of the base of the stem. Plants affected are generally unthrifty and undersized, leaves and branches tend to grow upward instead of spreading, forming a more or less compact top, later becoming light green or yellow, and whole plant eventually dying. A careful description of the appearance and predisposing causes of the disease are given, as well as notes upon the geographical distribution of the disease. The author recommends the rigid rejection of all seed tubers in any way cracked, bruised, discoloured or decayed, and the disinfection by steeping in formaldehyde of all tubers selected for planting. He carried out a careful investigation of the causal bacillus, which he recognizes as identical with that described by van Hall, whose description he revises, *Bacillus atrosepeticus*, and considers *B. melanogenes* of Pethybridge and Murphy to be synonymous.—F. J. C.

Potato Disease, A Form of, produced by Rhizoctonia. By G. B. Ramsey (*Jour. Agr. Res.* ix, pp. 421-426; June 1917; plates).—Two phases of damage to the potato tuber occur as a result of the attack of *Rhizoctonia Solani*: (1) somewhat resembles scab and extends as a dry core into the flesh of the tuber, (2) the shrinkage of the tissues produces a pit in the centre of the infected area somewhat like the attack of wireworm. Evidence is adduced in support of the idea that these symptoms are produced as a direct result of the attack of the fungus.—F. J. C.

Potato Diseases in Michigan. By G. H. Coons (*U.S.A. Dep. Agr. Exp. Stn. Mich., Special Bull.* 85, March 1918, pp. 1-48; 41 figs. in text).

Potato Diseases in Indiana. By H. S. Jackson and G. A. Osner (*U.S.A. Dep. Agr. Exp. Stn., Purdue, Cir.* 71, Sept. 1917, pp. 1-16).—The two bulletins give a popular account of the commoner diseases of the potato which are frequently met with in the two States, and give detailed directions for the making of Bordeaux mixture for spraying purposes.

The methods of control in general fall into three groups: (1) Sanitary and hygienic measures; (2) plant protection measures; (3) the use of resistant varieties or strains.

The first means clean seed in clean soil; the second deals with spraying as a measure of protection; while the third means the production of immune varieties.—A. B.

Potato Diseases, Investigations of. By G. H. Pethybridge (*Jour. Dep. Agr. Ireland*, xvii., pp. 1-8; 1917).—One per cent. Burgundy and Bordeaux mixtures were again found to be about equally efficacious with the 2 per cent. solutions when used against *Phytophthora* attack, but the latter is still regarded as to be preferred, mainly on the ground that the former needs more careful application.

In comparative trials against *Phytophthora* attack several varieties, in which the foliage proved somewhat susceptible, gave a very low percentage of diseased tubers, but conversely 'Champion II.' and 'Northern Invincible,' which are resistant in a high degree so far as foliage is concerned, produced a considerable percentage of diseased tubers, higher even than 'King Edward VII.,' in which the foliage is markedly susceptible.

Observations on the sclerotia of the *Botrytis* disease have failed to demonstrate the formation of an ascospore stage. In all cases the sclerotia on germination have produced *Botrytis* spores.

The *Verticillium* disease due to *Verticillium atro-album*, which causes a wilt disease of the plant, was found to be controllable by subjecting the tubers to a temperature of 46° C. for twenty hours (and in one case the mycelium in the tubers was dead at the end of ten hours). Further experiments are in progress with this disease.—F. J. C.

Potato Dry-rot, Further Observations on. By G. H. Pethybridge and G. A. Lafferty (*Sci. Proc. Dublin Soc.* xv. No. 21; June 1917).—The authors show that the dry-rot of potatoes in the British Isles is due as a rule to *Fusarium caeruleum*, not to *Fusarium Solani* Sacc. Recent work has enabled the distinctions between the species of this difficult genus to be more clearly grasped, and at the same time has cast doubt upon the correctness of the nomenclature of the fungi believed

to be the cause of dry-rot in the past. No connexion with a species of *Nectria* has been traced. The authors state that the dusting of potatoes in the clamp with quicklime and sulphur has no preventive value, but the experiments upon which this statement is based do not approximate to those in the clamp. The fungus more easily attacks the tuber later in the season than early, and the authors recommend that no diseased tubers should be planted. The fungus does not produce a wilt disease as do some other species of the genus.—F. J. C.

Potato "Leak," The Control of. By L. A. Hawkins (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 577, Sept. 1917, pp. 1-6).—The disease known as potato leak is caused by various organisms. Amongst the chief are *Rhizopus nigricans* (Ehrenb.) and *Pythium Debaryanum* (Hesse). The fungi obtain an entrance through wounds in the skin of the tubers and cause complete rotteness in the tubers. It is evident from the experiments that removal of all the wounded tubers from the stored potatoes is the most effective means of control, and care should be taken to avoid damaging the tubers when lifting them.—A. B.

Potatoes, Lime Sulphur versus Bordeaux Mixture as a Spray for. IV. By M. T. Munn (*U.S.A. Exp. Sta., Geneva, N.Y., Bull.* 421, May 1916).—The author in this bulletin again emphasizes the results obtained by use of lime sulphur on potatoes.

Lime sulphur as a spray injures the potato foliage, does not prevent the blight, and its use results in a marked decrease of tubers.—C. P. C.

Potatoes in Maine. By C. T. More (*U.S.A. Dep. Agr., Circ.* 48, April 2, 1915).—The conditions of potato-growing in Maine in 1915 gave rise to dissatisfaction among local growers, as they felt that the prevailing low prices of their crops were not justified. The extremely heavy production, together with the unsettled conditions, seem to have been responsible for the fall in prices.

This bulletin suggests improved methods of harvesting and marketing which would make for economy and urges rigorous grading of the crop through co-operative effort.—M. L. H.

Prickly Pear and Insects. By W. W. Froggatt (*Agr. Gaz. N.S.W.*, vol. xxviii, pp. 417-426; 4 plates).—Attempts to destroy Prickly Pear by Wild Cochineal, Round Cactus Scale (*Diaspis calyptroides*), the Rutherglen Bug (*Nysius vinitor*), and other insects have not been successful. It is now proposed to experiment with the large land snail (*Helix aspera*).—S. E. W.

Prickly Pear, Destruction of. By G. P. Darnell Smith (*Agr. Gaz. N.S.W.*, vol. xxix, pp. 1-12; 6 figs.).—At least two operations are necessary completely to destroy prickly pear by spraying. The spray is prepared by dissolving 20 lb. of white arsenic in 10 gallons of water containing 5 or 10 lb. of caustic soda. The application is best made in autumn. This destroys the segments, but in order to kill the roots the pears are slashed and re-sprayed. The dead cacti are raked together and burnt.—S. E. W.

Prickly Pears. By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxviii, pp. 650-652; 1 coloured plate).—*Opuntia vulgaris* has ovate joints and numerous short prickles. It bears spreading yellow flowers. This cactus is not found in Australia, but the name is frequently incorrectly given to the pest pear *O. inermis*.—S. E. W.

Primula malacoides. By A. W. Hill (*Jour. Genetics*, vol. vii, pp. 193-198, May 1918; plates).—Records the course of development of the now fairly numerous varieties of *P. malacoides*, first introduced to cultivation in 1908.

F. J. C.

Prumnopitys elegans. By A. Bruce Jackson (*Gard. Chron.* Jan. 12, 1918, p. 12, with 2 figs.).—The eighteenth of this series of critical notes on Conifers. Discusses establishing a separate genus for the group in which the receptacle does not become fleshy, under the name *Stachycarpus*.—E. A. Bd.

Pyrus triloba. By L. Trabut (*Rev. Hort.* vol. xc, pp. 8-9; 4 figs.).—*Pyrus triloba* is an ornamental tree valuable on account of its regular growth, and its beautiful foliage and flowers. Its fruit resembles that of the crab. It is very acid, but is used for making jellies. It is probable that the value of the fruit would be improved by cultivation.—S. E. W.

Radium as a Fertilizer. By C. G. Hopkins and W. H. Sachs (*U.S.A. Exp. Sta., Ill., Bull.* 177, Jan. 1915).—This bulletin confirms the whole of the experiments carried out with radium as a fertilizer. The authors clearly demon-

strate that there is no foundation for the belief that an increased crop yield, commensurate with expenditure incurred, may be expected from its use.

C. P. C.

Raspberry and Loganberry Beetle. By A. H. Lees (*Ann. Rep. Agr. Res. Stn., Long Ashton, 1917*).—The beetle *Byturus tomentosus* causes so much damage to raspberries and loganberries as to threaten the loganberry industry in some places. Three sprayings with nicotine wash were instrumental in reducing the amount of infection to a marked degree. The method was to spray with 2 per cent. paraffin emulsion and five minutes afterwards with a nicotine wash, consisting of soft soap 20 lb., paraffin 2 gallons, nicotine $\frac{1}{4}$ lb., water 100 gallons.

F. J. C.

Rats: How to exterminate them. By R. Sharpe (*Jour. Bd. Agri.* vol. xxiv. No. 12 vol. xxv. No. 1).—A long article by a practical man which cannot be properly abstracted. It points out the great losses due to rats, their natural enemies, and various methods of poisoning, trapping, &c. Illustrations are given of traps in position.—G. C. G.

Rhizoctonias Parasitic in America. By Geo. L. Peltier (*U.S.A. Exp. Stn., Illinois, Bull.* 189, pp. 283-390, June 1916; 23 figs.).—Two species of truly parasitic *Rhizoctonias* are recognized in America: the common form (*Rhizoctonia Solani* Kühn), *Corticium vagum* B. and C., which is widely distributed and occurs on a large number of plants; and *Rhizoctonia Crocorum* (Pers.) DC., with alfalfa and potato as hosts. Another *Rhizoctonia*, *Corticium ochroleucum* (Neack) Burt, is occasionally found on leaves of apple and pear. About 165 species of plants are more or less subject to attacks of *Rhizoctonia*.

The author thinks, as a result of inoculation experiments with numerous types of plants, that all the strains, obtained from a wide range of hosts of different geographical origin, can attack the same species of plant and produce the same characteristic symptoms. The virulence of *R. Solani* is variable, and it is found abundantly in cultivated soils, where it can live upon weeds or dead organic material.—A. B.

Rhododendron auriculatum. By A. D. (*Irish Gard.* xii., Oct. 1917, p. 149).—A striking new species introduced by E. H. Wilson from China.—E. T. E.

Rhododendron oreotrophes. By J. W. B. (*Irish Gard.* xiii., Jan. 1918, p. 5).—A brief descriptive note on this desirable new species, discovered by George Forrest. Its rosy-lavender flowers make it attractive.—E. T. E.

Rhododendron rubiginosum. Anon. (*Irish Gard.* xiii., Aug. 1917, p. 118; 1 fig.).—A useful but neglected species introduced by Abbé Delavay. It should be much more largely grown. It flowers in April and May, colour being rosy lilac.—E. T. E.

Rhododendrons, Chinese. Anon. (*Irish Gard.* xiii., May 1918, p. 72; 1 fig.).—A note on some useful *Rhododendrons* collected in China by George Forrest.—E. T. E.

Rhododendrons, Some Notes on. By J. R. of B. (*Irish Gard.* xiii., June 1918, pp. 82-86).—A delightful article by a well-known tree and shrub enthusiast, dealing with a large number of beautiful species and varieties.

E. T. E.

Rosa cerasocarpa Rolfe (*Bot. Mag.* t. 8688; Dec. 1916).—A climbing species with many-flowered clusters of white flowers in June, each about $1\frac{1}{4}$ inches across, and deep-red globose fruits in November. The sepals and styles are deciduous. Native of China.—F. J. C.

Rosa Davidii Crép. By R. A. Rolfe (*Bot. Mag.* t. 8679; Oct. 1916).—A hardy shrub 5 to 6 feet high, with leaves 3 to 4 inches long, grey-puberulous beneath, and rose-pink flowers about $\frac{1}{2}$ inch across in loose corymbs. Fruits ovoid, pink, with persistent sub-erect sepals. Common in mountains of Moupin, W. Szechwan, where the seed was collected by Mr. Wilson in 1908.—F. J. C.

Rosa Moyesii. By R. M. P. (*Irish Gard.* xiii. p. 107, July 1918).—A beautiful plant introduced by Wilson. Flowers large, and brick-red colour. Bush habit. Height, 6-8 feet. Fruits dark red, bottle-shaped. Propagation by seeds sown indoors.—E. T. E.

Rose Diseases, More about. By L. M. Massey (*Amer. Rose Annual*, pp. 63-71, April 1918).—Crown canker, black spot, and mildew of the rose are dealt with. *Cylindrocladium scoparium* is the fungus producing crown canker, a lingering disease causing cracking and cankering at the base of the stem and yellowing of the foliage. Thorough drainage, soil sterilization, and the selection of healthy scions and stocks are the control measures recommended. Dust spraying for black-spot and mildew was found more effective than lime-sulphur or Bordeaux mixture, the sulphur-arsenate mixture being recommended. (See these Abstracts, "Dusting and Spraying Nursery Stock.")—F. J. C.

Rose, The Dunwich. By Viscount Dunwich (*Gard.* Oct. 13, 1917, p. 428).—The Dunwich Rose is a very nearly true *R. hispida*. It is bushy, and never grows more than 2½ to 3 feet high. Leaflets are 7 to 11, serrated. This rose is almost extinct. It was no doubt growing in the ruins of Dunwich, and has been cultivated. The flower is semi-double and grows in groups of three; it is almost white, but has a tinge of yellow. On p. 304 (Aug. 4) Mr. James Britten had suggested that this rose was a variety of *R. spinosissima*, and this view is adopted in a note by the editor.—H. R. D.

Roses for Cutting, Long-stemmed. By G. J. (*Gard.* June 22, 1917, p. 220).—The author recommends Mme. Alfred Carrière (white) and Zéphyrine Drouhin (rose), the latter to be grown as a hedge with access on both sides. The rose-red blooms are not only deliciously sweet, but they are well shaped and long-lasting, and the almost entire absence of prickles makes it a pleasant rose to cut by the armful.—H. R. D.

Roses, Hybridation of. By J. Perney-Ducher (*Le Jard.* vol. xxxii, p. 205).—The author observed the formation of a hybrid of a yellow 'Pernetiana' and the red hybrid tea 'Admiral Ward.' The parents were grown side by side in a border, and the fertilization was probably due to bees. This is believed to be a unique case of the production of such a hybrid without human aid.—S. E. W.

Roses, Sweet Scented. By H. Blin (*Rev. Hort.* vol. lxxxix, pp. 336, 337).—The following roses are remarkable for their perfume: 'La France,' 'La France Victorieuse,' 'Baronne de Rothschild,' 'Mrs. John Laing,' 'Madame Maurice de Lize,' 'François Juranville,' 'Gerbe Rose,' 'Marie Baumann,' 'Charles Lefèvre,' 'Etienne Lebet,' 'Commandant Félix-Faure,' 'Dupuy Jamain,' 'Prince Arthur,' 'Sénateur Vaisse,' 'A. K. Williams,' 'Général Jacqueminot,' 'Madame Gabriel L'izet,' 'Hugh Dixon,' 'Horace Vernet,' 'Augustine Guinousseau,' 'Richmond,' 'Vicomtesse Folkestone,' 'Château de Clos-Vougeot,' 'General MacArthur,' 'Betty,' 'John Ruskin,' 'Lady Alice Stanley,' 'Catherine Mermet,' 'Muriel Graham,' 'Innocence,' 'Mme. Cusin,' 'Devoniensis,' 'Souvenir de S. A. Prince,' 'Goubault,' 'Souvenir de William Robinson,' 'Lady Roberts,' 'Mirechal Niel,' 'Lamarque,' 'L'Idéal Mme. Alfred Carrière,' 'Isaac Pereire,' 'Zéphyrine Drouhin,' 'Anna Maria de Montravel,' 'Léonie Lamesch,' 'Stanwell Perpetual,' 'Nitida,' 'Altaica.' 'Alpina' has a curious resinous scent, and 'Indica semperflorens' possesses a very penetrating and peculiar odour.

S. E. W.

Sargisiorba obtusa var. *amoena* Jesson (*Bot. Mag.* t. 86901 Dec. 1916).—A hardy perennial from Japan, growing 3 to 4 feet in height with large radical leaves and cylindric spikes of rose-purple flowers. Introduced by Messrs. Barr.

F. J. C.

School Garden and Allotments. By L. J. R. (*Irish Gard.* xliii, Jan. 1918, p. 11).—Contains some sound advice on School Gardening.—E. T. E.

Sciara Maggots injurious to Potted Plants. By H. B. Hungerford (*Jour. Econ. Entom.* 9, p. 538, Dec. 1916; figs.).—Reports damage to pot plants by the shiny, black-headed white larvae of *Sciara coprophila*, which fed upon roots and stems. The life-history was worked out in detail, and some suggestions are made as to dealing with the pest.—F. J. C.

Spirea pennsylvanica. By E. H. Jenkins (*Gard.* May 12, 1917, p. 167; fig.).—The 'American Wild Pink,' though known to cultivators for a century or more, is by no means common even in good collections of alpine plants.

The flowers vary from purplish rose to rose pink, and all are beautiful. Growing 6 or 8 inches high it ranks to-day among rock-garden varieties, so good as to merit general cultivation. In its North American home it favours sandy, rocky, or gravelly places, though experience proves these are not essential, and that it

will grow quite well in deep gritty loam. It is easily raised from seed, but by no means easy to increase otherwise. Slugs are fond of it.—H. R. D.

Skin Irritation, Plants and. By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxix. pp. 344-345).—Inflammation of the skin is caused by contact with the following plants: Noogoora Burr (*Xanthium strumarium*), Stinkwort (*Inula graveolens*), and *Senecio Hectori*.—S. E. W.

Snowdrops, Autumn Flowering. By E. A. Bowles (*Gard.* p. 4, Jan. 6, 1917).—The suggestion that these are forms of *Galanthus nivalis* does not apply to the two known as *G. Olgae* and *G. Rachelae* which flower in the end of October. *G. cilicicus* must be reckoned as a form of *G. nivalis*, showing its buds before the shortest day, and so earlier than the type. *G. byzantinus* and *G. Elwesii* are apt to flower early the first season after planting, and then gradually accommodate themselves to the snowdrop season, but certain individuals of *G. byzantinus* retain the early-flowering habit (in flower December 20). *G. Elsae* and *G. Olgae* probably prove consistently autumnal.—H. R. D.

Soil Acidity and the Hydrolytic Ratio in Soils. By C. H. Spurway (*Jour. Agr. Res.* xi. 12, pp. 659-672).—Investigations in soil acidity indicate a relationship between iron and aluminium compounds in soils and their reaction to litmus paper and phenolphthalein indicator. The author finds that all the acid soils have ratios $\text{CaO} : \text{Fe}_2\text{O}_3 + \text{Al}_2\text{O}_3$ above 1 : 1.3, and all alkali soils have ratios below this figure. He believes that the reactions of the soils depend chiefly upon the hydrolytic ratios existing between the compounds of the alkali earths and iron and aluminium.

A method of determining the calcium oxide required to neutralize a soil by indirect titration is described where a standardized calcium hydroxide solution is allowed to react with varying amounts of soils. The concentrations of soil and solution giving a neutral reaction are found by comparing the electrical resistance of the several solutions, and also by phenolphthalein. The greatest electrical resistance and faint colour of the indicator is coincident with the concentration giving a neutral reaction.

The quantities of lime required to neutralize the acid soils is determined by computing the quantities of calcium oxide necessary to add to the acid-soluble calcium oxide found in the soils to bring the ratios $\text{CaO} : \text{Fe}_2\text{O}_3 + \text{Al}_2\text{O}_3$ to 1 : 1.3. The quantity required corresponds closely with the quantities required when determined by the indirect titration method.

A short bibliography is appended.—A. B.

Soil, Effect of Decomposing Organic Matter on the Solubility of Certain Inorganic Constituents of the. By C. A. Jensen (*Jour. Agr. Res.* ix. pp. 253-265).

—The author finds the solubility of compounds of calcium, magnesium, iron, and phosphoric acid in soils measurably increased by the addition of green manures, stable manures, and their extracts.—F. J. C.

Soil Flora Studies. By H. Joel Conn (*U.S.A. Exp. Stn., New York, Tech. Bull.* 57, 58, 59, 60, Jan.-March 1917).—The first of this series deals with the general characteristics of the microscopical flora of the soil, and the methods best adapted to the study of the soil flora. The second bulletin deals with the spore-forming bacteria in soil; the third with the non-spore-forming bacteria; and the last one deals with the form Actinomycetes in soil.

The soils were obtained from various parts of New York State, and the results obtained have extended over eight years. The determinations were made by the plate method, since this enabled the relative number of different organisms in the soil to be ascertained. Over 1,000 pure cultures of these organisms were made, and their characteristics studied by various methods. Non-spore-forming bacteria (mostly non-motile rods) were most abundant, and next to these are the various types of Actinomycetes. Spore-forming bacteria have also been found, but in no great numbers. The author's conclusions may be set forth as follows:

1. Of the spore-forming bacteria in these soils, *Bacillus megatherium* (Debary), *B. mycoides* (Flügge), *B. cereus* (Frankland), were the most abundant. *B. simplex* (Gottheil) also occurs in somewhat smaller numbers. These bacteria are ordinarily inactive in soil and form a relatively small part of the flora of the soil, and seem to occur in normal soil only as spores.

2. The largest number of soil bacteria were found to be non-spore-forming organisms. Of these the most abundant type is *B. fluorescens* (Flügge) Migula, especially in well-aerated soils, or soils containing organic matter recently added, but in older soils the numbers of this organism are considerably reduced. This seems to indicate that they are amongst the most active of soil micro-organisms.

3. From 12 to 50 per cent. of the colonies on plate cultures are those of Actinomycetes. The author finds about seventy different types occur; three of them are of fairly common occurrence, and of these one is considered to be a new species, *A. phaeochromogenus*; another appeared to be associated with potato-scab organism; while the third is not a distinct species. Indications show that they are an active and numerically important group of micro-organisms in soils.—A. B.

Soil Moisture, The Movement of Soluble Salts with the. By F. S. Harris (*U.S.A. Exp. Stn., Utah, Bull.* 139, May 1915).—Large tracts of low-lying lands have of late years accumulated alkali salts to such an extent as to cause them to go entirely out of cultivation.

It is found that this infertility is caused by the movement of soluble salts from the uplands through the excessive irrigation of same.—C. P. C.

Soil, Potassium from. By C. G. Hopkins and J. P. Aumer (*U.S.A. Exp. Stn., Ill., Bull.* 182, May 1915).—The addition of green and farm manures to the soil will normally release more than sufficient potassium for the use of most farm crops, particularly corn and clover. The authors suggest that no further artificial additions should be made.—C. P. C.

Soil, Summer Treatment of Greenhouse. By W. J. and S. N. Green (*U.S.A. Exp. Stn., Ohio, Bull.* 281, Jan. 1915).—It is customary in the above State to allow the greenhouses to lie fallow for six to ten weeks in the summer, expecting that the dryness and heat would clear off most of the pests inherent to glasshouse cropping.

By some comprehensive experiments the authors show that it is better to manure, mulch, and water the top soil, such treatment considerably adding to the crop later on.

The only exception being a following crop of lettuce which seems to do almost equally well in the dry or mulched soils.

Sterilization is recommended, but the authors deprecate the constant application of steam for this purpose, as it tends to strong stimulation of growth leading to malnutrition. It has also been shown that harmful compounds as well as beneficial are formed, and when the former overbalance the latter the fertility of the treated soil is affected adversely. Some hints as to feeding and watering are given.—C. P. C.

Soil, The Effect of Sulphate of Ammonia on. By R. W. Rupprecht and F. W. Morse (*U.S.A. Exp. Stn., Mass., Bull.* 165, Nov. 1915).—From the numerous experiments carried out over a number of years, the authors deduce that the constant application of sulphate of ammonia to unlimed soils does not tend to create acidity. In the various trials both unlimed and limed plots remained neutral under repeated yearly doses. The decomposition of sulphate of ammonia in the soil is, in the first stage, an absorption of the ammonia until the soil cannot hold any more, such absorption being greater in the limed soil. Any sulphate remaining is then decomposed in the soil, first attacking the calcium carbonates and in their absence the salts of iron and aluminium, and it is to the presence of the resulting compounds of iron and aluminium that the harmful effects of the constant application of sulphate of ammonia to unlimed soils appear to be due.—C. P. C.

Soils, Effect of Temperature on Some of the most Important Physical Processes in. By George J. Bouyoucos (*U.S.A. Exp. Stn., Mich., Tech. Bull.* 22, July 1915).—Many valuable and interesting results are tabulated in this bulletin.

The most striking conclusions are: (1) "That there is practically no loss of vapour during the night, and that contrary to popular belief the dew is not caused by the water vapour rising from the soil." (2) That the influence of temperature on the aeration of soils is very great."

This is caused not only by the expansion of the gases, but by absorption by soils at different temperatures, and particularly through the presence of soil moisture as vapour.—C. P. C.

Soils, Factors Influencing the Lime and Magnesia Requirements of. By W. H. MacIntyre (*U.S.A. Exp. Stn., Tenn., Bull.* 105, Jan. 1916; 23 tables).—The above is a purely technical bulletin dealing with a "Method for the determination of the immediate lime requirements."

Therein is described the newest methods and the apparatus to be used. It is demonstrated that SiO_2 is very active in the decomposition of lime and magnesium carbonates in soils.—C. P. C.

Soils, The Use of Dynamite on the Improvement of Heavy Clay. L. E. Call and R. I. Thockmorton (*U.S.A. Exp. Stn., Kansas, Bull.* 209, Dec. 1915).—It was anticipated by some that the use of explosives would be the means of lessening the labour of improving soils. This is the case with some types of soil, but the experiments set out in the above bulletin show that on heavy clay soils the use of explosives is distinctly detrimental.

The soil was blown into jug-shaped cavities, the sides of which were compacted and partially baked, so that the complete "dynamite jug" could be dug out weeks afterwards.

Such cavities quickly filled with water, which remained for a considerable time to the detriment of the trees planted in them. Trees planted near the holes were no better than those placed on untreated land.—C. P. C.

Soy Bean, The. By C. V. Piper and W. J. Morse (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 439, Dec. 20, 1916, 20 pp.; 3 figs., 12 tables).—A valuable oil can be extracted from the Soy Bean, and the residue ground into meal suitable for both human and animal food. It has also a high value as a fertilizer, but is more economically fed to stock, and the resulting manure applied to the soil. The oil has been used for soap-making, and (after refining) as an edible table oil, or in the manufacture of butter substitutes. Other uses are in the manufacture of linoleum, of a rubber substitute, and of certain types of paint.—F. G. A.

Spinach Carrion Beetle (*Silpha bituberosa* Lec.). By R. A. Cooley (*Jour. Econ. Entom.* x., pp. 94-102; Feb. 1917).—In the States, so far as is known, this beetle does not occur west of the main divide of the Rocky Mountains excepting in Idaho. Its usual food is weeds belonging to the Chenopodiaceae, and it appears to migrate into the sugar-beet fields from this source. The beetle and larvæ are most injurious when the plants are very small, and feed mostly at night time. A closely allied species *S. opaca* is one of the most troublesome insect pests to beet-growers in Germany, and troublesome at times in Britain. The most effective remedy was found to be poison bran mash, prepared according to the usual formula. This is scattered amongst the weeds near to the beet-field, where the beetle is known to be numerous. It feeds greedily on the bait, and is found dead on the ground in abundance next day. The author gives a full life-history of the beetle and the article is accompanied by an excellent plate.
G. W. G.

Spray, Double Purpose. By A. A. Ramsay (*Agr. Gaz. N.S.W.* vol. xxviii, pp. 435-437).—Mixing lead arsenate with soap solution is not advisable, as it renders the mixture dangerous by increasing the solubility of the arsenic. Lead arsenate may be added to Bordeaux or lime sulphur mixture without detriment. These mixtures serve the double purpose of insecticide and fungicide.—S. E. W.

***Stapelia Gettleffii* Pott.** By N. E. Brown (*Bot. Mag.* t. 8681).—Nearly allied to *Stapelia hirsuta*. Rudimentary leaves erect at angles of stem. Flowers about 6 inches across, velvety outside, yellowish-green within, the lobes being broadly edged with purple and everywhere else lined transversely with yellow and purple. Native of Transvaal.—F. J. C.

Strawberries, Rhizopus Rot in Transit. By N. E. Stevens and R. B. Wilcox (*U.S.A. Dep. Agr., Bull.* 531, pp. 22).—*Rhizopus nigricans* is shown to be the cause of decay of strawberries in transit; a lower temperature is advised in refrigerator cars as the best preventive.—E. A. Bd.

Strawberry-growing in the South. By H. C. Thompson (*U.S.A. Dep. Agr., Farm. Bull.* 664, April 30, 1915; figs.).—The strawberry is the most valuable of the small fruit crops grown in the United States. Directions are given on choice of situation, propagation, soil, preparation of soil, fertilizers, planting, mulching, and harvesting, with a list of varieties considered best at the moment, an estimate of the cost of growing strawberries in the South, and a few hints on the utilization of the by-products of the crop.—M. L. H.

Strawberry, North American Varieties of. By S. W. Fletcher (*U.S.A. Exp. Stn., Virginia, Bull.* 11, pp. 126; 18 figs.).—A list of 1879 names of varieties with references to literature, origin, and brief descriptions. A valuable feature is the Bibliography at the end, giving a large number of references to North American Strawberry literature.—E. A. Bd.

Sweet Corn. By H. Wenholz (*Agr. Gaz. N.S.W.* vol. xxviii., pp. 384-390).—Sweet corn is a distinct type of maize and is less hardy than ordinary maize.

It should be planted in shallow furrows, in a deep, sandy loam enriched with stable manure, on a sunny situation. Superphosphate is applied in the drills at the time of planting, at the rate of 1 or 2 cwt. per acre. The ground must be kept free from weeds, and the surface of the soil must be frequently broken up. It is an advantage to remove the suckers and use them for fodder. The ears are removed when ripe, and the stalks are used as food for cattle. The best varieties of sweet corn are: 'Golden Bantam,' 'Peep of Day,' 'Early Darling,' 'Cosmopolitan,' 'White Evergreen,' 'Stowell's Evergreen,' and 'Country Gentleman.'—S. E. W.

Sulphur-Arsenate of Lead Dust, Further Trial of, against the Strawberry Weevil. By Thomas J. Headlee (*Jour. Econ. Entom.* x., pp. 287-290; April 1917).—Good results were obtained by the use of sulphur and lead arsenate in equal parts, and in the proportion of 1 to 5 in reducing the damage done by a strawberry weevil (*Anthonomus signatus* Say). It is recommended that a rather complete coating of the buds should be given with the 1 to 5 strength, as this is the cheaper; preferably by means of power machinery.

The protective action is said to be largely due to a repellent effect. Two dustings gave an increase in crop of about 200 per cent. over the control plot. G. W. G.

Sun-Scald of Fruit Trees. By A. J. Mix (*U.S.A. Exp. Stn., Cornell, Bull.* 382, Oct. 1916; figs.).—Apple trees show, as the result of sun-scald, injury to bark, cambium, and outer sapwood on the south-west side of the tree. The injury is probably due to direct freezing to death of the tissue. It is usually brought about in late winter and is not the result of incomplete ripening of tissues. Whitewashing the trunks in autumn or early winter is recommended as a preventive.—F. J. C.

Tarnished Plant Bug (*Lygus pratensis*), Further Experiments in the Control of. By M. D. Leonard (*Jour. Econ. Entom.*, 8, pp. 361-367; June 1915).—Attempts were made to reduce the number of individuals of *Lygus pratensis*, which invaded a bed of peaches for budding by surrounding it with a close-meshed wire netting six feet high, having a band of Tangle-foot grease four inches deep near the top. The number was reduced but not sufficiently to protect the trees or to pay for the trouble. It is, however, assumed that all the insects captured came from outside the cage, which enclosed 13 acres. The puncturing of the terminal shoot of the tree by the bug damages it so severely that none of the pruning methods of control served to recover the trees.—F. J. C.

Telopea oreades Muell. By O. Stapf (*Bot. Mag.* t. 8684; Nov. 1916).—*Proteaceae* (*Embothriaceae*). Native of Victoria and New South Wales, and hardy in south-west Cornwall, where it flowered in 1915 in Rev. A. Boscawen's garden. Leaves linear oblong, 6 to 8 inches long. Flowers in capitate racemes, crimson, about one inch in length.—F. J. C.

Thuranthos macranthum. By C. H. Wright (*Bot. Mag.* t. 8680).—*Liliaceae* (*Scilleae*). Allied to *Ornithogalum*. Collected by Canon and Miss Mason in Tembuland; flowered at Cambridge, 1913. Flowers variable, red-brown, yellow-green, or brown with a red band, petals banded with green, borne on an erect scape, $3\frac{1}{2}$ to 6 feet long.—F. J. C.

Timber Shortage Conditions in the Eastern and Southern States with Reference to Decay Problems. By C. H. Humphreys (*U.S.A. Dep. Agr. Bull.*, May 17, 1917).—As a preliminary to an investigation into the prevalence of decay in building timbers, with the prime object of securing some basis for the effective control of such losses, a field study covering about seven months' active work was undertaken during 1914 to determine the conditions under which lumber and structural timbers are stored, for timber infected with wood-destroying fungi during storage may be the direct cause of outbreaks of rot in buildings when such timber is placed in situations favourable to decay.

Decay in timber is almost exclusively due to the action of fungi, the greater part of the destruction being referable to one of the higher groups of these organisms, namely, the Hymenomycetes. In the life circle of these fungi there are two distinct phases of development: (1) the vegetable stage (mycelium), and (2) the fruiting stage.

There are two general methods by which wood-destroying fungi spread from infected to sound timber: (1) By a direct overgrowth of mycelium from an infected stick to adjoining or near-by timber, and (2) by the blowing about of spores produced by the fruit bodies or by the mycelium.

The preservative treatment of timber involves no heavy expenditures for apparatus, especially in connexion with the simpler methods of treatment. The kyanizing process consists merely in the immersion of the timber in an open wood or concrete tank containing a solution of mercuric chloride. Any of the other water-soluble salts could be applied in the same way. Creosotes and carbolineums can also be applied in this manner.

Strong efforts should be made to store the product on well-drained ground, removed from the possible dangers of floods, high tides, and standing water.

More attention should be given to the foundations of lumber piles in order to ensure freedom from decay and better ventilation beneath the stacks. In humid regions the stock should not be piled less than 18 to 24 inches from the ground. Wood blocking used in direct contact with wet ground should be protected by the application of creosote or other antiseptic oils or else replaced by concrete, brick, or other durable materials. Treated horizontal skid timbers would also be highly advantageous, for stock should never be piled in direct contact with diseased timber.—A. D. W.

Tobacco, Mosaic Disease. By H. A. Allard (*Jour. Agr. Res.* x, pp. 615-631, Sept. 1917; figs.).—The virus of mosaic disease may be transmitted by rubbing healthy after touching affected foliage, but washing the hands with soap and water removes the virus. It appears to travel from place to place in the plant independently of the veins. The chief agents in spreading it appear to be aphides, such as *Myzus persicae* and *Macrosiphum tabaci*, but *M. lachryae*, red spider, and white fly did not, apparently, carry it. The virus affects *Nicotiana glauca*, but does not produce marked symptoms upon that species. Tobacco may, however, be readily infected from inoculated plants of *Nicotiana glauca*.—F. J. C.

Tomato Damping Off and Collar Rot. By G. T. Spinks (*Ann. Rep. Agr. Res. Stn., Long Ashton*, 1917).—The disease was found to be associated with a species of *Phytophthora*, and to be controllable by sterilization of the soil.—F. J. C.

Tomato Leaf-Spot Control. By F. J. Pritchard and W. B. Clark (*U.S.A. Dep. Agr., Bur. Pl. Ind., Cir.* 4, June 1918, 4 pp.).—This blight of the tomato is a troublesome disease, causing loss of many million dollars in the Mississippi Valley and Atlantic States. The disease forms small circular spots with grey centres, and with dark-coloured margins. For control, Bordeaux mixture of 4, 2, 3, 30 strength is suggested, and having a composition of copper sulphate, quicklime, resin, fish-oil soap, and water.—A. B.

Tree-banding Material for the Control of the Gipsy-Moth, A New. (By A. F. Burgess and E. L. Griffin (*Jour. Econ. Entom.* x, pp. 131-135; Feb. 1917).—The formula given in this paper is based largely on an analysis of Raupenleim, which is a tree-banding material that has been successful against Gipsy-moth in the German forests. The instrument used for applying it direct on to the tree consists of a cylindrical container having a small rectangular orifice in one end. The banding material is forced from the container by a plunger operated by a kind of cantilever movement. The fingers of the operator's right hand pass through a part of the apparatus not unlike large garden scissors, by means of which the necessary pressure on the plunger is obtained. (An excellent plate shows the instrument in use, and it appears to be a great improvement on the usual method employed in this country.) The sample of tree-banding material which gave the best results consisted of:

- (1) A high boiling neutral coal-tar oil (density about 1.15 at 20° C.).
- (2) A soft coal-tar pitch.
- (3) Rosin oil of the grade known in America as first-run "kidney oil."
- (4) Ordinary commercial quicklime.

A stock mixture was made up by transferring a weighed quantity of coal-tar pitch to a ten gallon steam-jacketed kettle. This was heated until thin enough to run, when twice its weight of coal-tar neutral oil was stirred in. This will be referred to as "pitch-neutral oil mixture." The quicklime was slaked so as to make a dry powder and passed through a sieve having ten meshes to the inch.

The tree-banding material may be mixed as follows:—

5 lb. of the "pitch-neutral oil mixture," 16 lb. coal-tar neutral oil and 4 lb. slaked lime were weighed into the steam-jacketed kettle and a mechanical stirrer started. When the contents were of a uniform consistency 20 lb. of rosin oil was added, and ten minutes later 10 lb. more of the coal-tar neutral oil. Fifteen

minutes later the stirring was stopped, and the material left for two days, in which time it sets to a semi-solid cake. A further 2 lb. of coal-tar neutral oil was subsequently stirred into each 50 lb. of the mixture in order to give it the desired oily surface. It is said to be considerably cheaper than any other successful banding material at present obtainable. The bands remain on the trees during the winter and can be moistened with turpentine in the spring so that they will be effective for two seasons.—G. W. G.

Trollius. By S. Mottet (*Rev. Hort.* vol. xc, pp. 102-103; 1 col. plate).—*Trollius Ledebouri* has been recently re-introduced into cultivation. It is of erect habit with branching stems. The flowers are remarkable for their warm orange colour and their crown of long petals. It is of easy cultivation.

T. pumilus var. *yunnanensis* bears large yellow flowers resembling a *Ranunculus*. It likes a light rich soil in a half-shady position.—S. E. W.

Turnips, A Colletotrichum Leaf-spot of. By B. B. Higgins (*Jour. Agr. Res.* x., pp. 157-162; July 1917; figs.).—*Colletotrichum Higginsianum* (Saccardo) attacks turnip foliage, stems, and seed-pods, producing small circular straw-coloured spots upon them. It was not found to be carried in the seed as are *C. Lindemuthianum* in beans and *C. Gossypii* in cotton.—F. J. C.

Vegetables, Tests with Nitrate of Soda in the Production of Early. By J. W. Lloyd (*U.S.A. Exp. Stn., Ill., Bull.* 184, Nov. 1915).—The use of nitrate of soda as a fertilizer for early crops of vegetables is recommended.

Bi-weekly application to cabbage, cauliflower, spinach, radishes, turnips, and beets proved profitable, but not to onions and lettuce.—C. P. C.

Vine, A Non-Parasitic Malady of the. By F. E. Gladwin (*U.S.A. Exp. Sta. New York, Bull.* 449, pp. 97-110, March 1918; 3 plates).—The malady first made its appearance in the summer of 1910 and was supposed to be chlorosis, but later observations disclosed their dissimilarity, for it shows itself on light soils during drought and on heavy soils when excessively wet. The first indications show a bleaching between the bundles, which afterwards turn yellow and the whole leaf is soon affected. This checks the growth of the vine, and the fruit does not form satisfactorily. Soils deficient in organic matter are often associated with this malady, and younger vines are more often affected than older ones. Sulphate of iron—the general measure of control for chlorosis in Europe—fails to lessen the affection. The only cure is the addition of considerable amounts of organic matter to the soil. Stable manure and green manuring are both useful in this connexion.—A. B.

Vine, Little-leaf of the. By F. T. Bioletti and Léon Bonnet (*Jour. Agr. Res.* viii. p. 381; March 6, 1917; figs.).—This disease, said to vie in seriousness with Phylloxera and Oidium, and confined to sandy soil in California, is characterized by small, yellowish leaves, short-jointed canes, and, in several cases, dead spots on the leaves and gummy secretions in the conducting tissues. In severe cases the vines die after a few years, in slight cases the fruit is set imperfectly. No specific organism has been found connected with the disease, and local soil conditions are suspected as the cause. No cure has yet been discovered.—F. J. C.

Walnut Blight in Eastern United States. By S. M. McMurran (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 611, Dec. 1917, pp. 1-8; 2 plates).—Walnut Blight or Bacteriosis is distributed generally throughout the Eastern States. During the summer of 1916 pure cultures of the causal organism were obtained from naturally infected nuts; inoculation experiments were conducted in healthy nuts and twigs, and uniformly produced the disease. From the observations of the author, it is stated that late infections were the rule in 1916. The micro-organism causing the disease is now known as *Bacterium juglandis* (Pierce) Erw. Smith.

Extensive experiments to control this disease by spraying have been conducted from time to time in California, but the results have never been entirely satisfactory. The apparent means of control is the production of immune or highly resistant varieties, and wide planting of small numbers of trees is suggested.

A. B.

War-Time Flowers. By R. M. Pollock (*Irish Gard.* xiii., March 1918, pp. 41-42; 1 fig.).—A useful but brief contribution enumerating a number of

flowers deemed suitable for war-time. We notice that one of the best of all war-time flowers (*Calendula grandiflora* 'Prince of Orange') is omitted.

E. T. E.

Wasp Enticer. By Pennick Jones (*Gard.* June 16, 1917, p. 220).—*Pyrus erythrocarpus* in bloom in June exercises a peculiar fascination to queen wasps, and the author states he had captured many scores on a bed of these plants, and it should be tried in every garden for this purpose. The plant is also very attractive, with its glossy leafage and striking autumnal tints. The showy black sheeny berries borne till winter enhance its merits.—H. R. D.

Water-lilies, Leaf-spot of. By F. V. Rand (*Jour. Agr. Res.* viii. pp. 219-232, February 1917; figs.).—The disease appears first as tiny black specks on the leaf blade, often reddish or bordered with red. Later the entire leaf may become a dark greenish black mass of tissue that falls apart on the slightest touch. The causal fungus was isolated from the leaves of *Nymphaea odorata* and proves to be a new species, which is named *Helicosporium nymphaearum*.—F. J. C.

Water-Melon Diseases. By W. A. Orton (*U.S.A. Dep. Agr., Farm. Bull.* 821, May 1917; 11 figs.).—This bulletin gives a popular account of the commoner diseases of the water-melon, including "Wilt," caused by *Pituitum niveum* (Erw. Sm.); "Root-knot," caused by nematode *Heterodera radiscicola* (Greef) Müller; Anthracnose, caused by *Colletotrichum lagenarium* (Pass.) Ell. and Hialst.; Stem End Rot, caused by *Diplodia* sp.; Stem Bight, caused by *Mycosphaerella citrullina* (Sm.) Gr.; Bacterial Wilt, caused by *Bacillus tracheiphilus* (Erw. Sm.); and Downy Mildew, caused by *Peronosplasmopara cubensis* (B. and C.) Clint. Control measures are suggested for the various diseases.—A. B.

Watering at Midday. By C. Rivière (*Rev. Hort.* vol. xc. pp. 85-87).—Experiments show that when cultivated soil exposed to the sun at midday is watered, only a fall of 6° F. is observed at a depth of 4 inches. This is not sufficient to check the growth of a plant. The effect is much greater in an untilled soil, or in pots. When a plant flags, water it whatever the temperature may be.

S. E. W.

Water in a Soil, Relation of Movement to Hygroscopicity and Initial Moistness. By F. J. Alway and G. R. McDole (*Jour. Agr. Res.* x. pp. 391-428; Aug. 1917).—The downward movement of water and rate of penetration under various conditions of moisture and composition are dealt with. Comparisons are made with the rate and height of capillary rise, and they are found not to coincide with rate and depth of penetration in the same soil.—F. J. C.

Weeds, Effect on Crops. By Dr. Winifred Brenchley (*Jour. Bad Agr.* vol. xxix. No. 12 March 1918).—Gives results of some experiments undertaken at Rothamstead to test the amount of harm wrought by weeds on crops. The conclusion came to was that "the essential factor in the relation of crop with weed is that of competition for food, space, and light rather than that of the toxic excreta from roots." There was no evidence of any poisonous secretion from the roots, although other investigators have reached different conclusions. In connexion with the competition for food, space, and light, it was proved that thickly sown wheat made less growth, plant for plant, than thinly sown wheat in the presence of weed, indicating that the competitive action of wheat with itself was stronger than that of the weeds.—G. C. G.

Weeds: How to Control them. By H. R. Cox (*U.S.A. Dep. Agr., Farm. Bull.* 660, May 12, 1915; pl.).—Three injunctions are laid upon the farmer which will remove the need for much of this work of weed destruction by removing the cause of weed growth:—

- (1) Prevent weeds from going to seed.
- (2) Prevent weed seed from being brought to the farm,
- (3) Prevent perennial weeds from making top growth, and so starve out the underground parts.

This bulletin is divided into sections dealing with each of these stages in the extinction of weeds, and gives a list of the fifty worst weeds in the United States, with their characters, duration of life, a short description of each, and where and under what conditions they do most mischief.—M. L. H.

Weeds of New South Wales. By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxviii. pp. 409-416 and 563-570; xxix. pp. 31-37 5 plates).—Blue Weed (*Echium*

Plantaginaceum), St. John's Wort (*Hypericum perforatum*), the True Star Thistle (*Centaurea Calcitrapa*), and Cockspur (*C. militensis*) are spreading fast in New South Wales and threaten to become dangerous pests. The Thorn Apple or False Castor-oil Plant (*Datura Stramonium*) is widely distributed in New South Wales. Owing to the poisonous nature of the seed, every attempt should be made to eradicate it. The Wild Onion (*Allium fragrans*) threatens to be a serious pest.—S. E. W.

White Grubs and May-beetles (*Lachnosterna*), A Chemical Feeding Analysis of, and its Economic Application. By John J. Davis (*Jour. Econ. Entom.* x., pp. 41-44; Feb. 1917).—The American practice of feeding off standing corn to pigs is shown to be a good one. Their liking for white grubs and caterpillars is well known, and may profitably be taken advantage of for the destruction of soil-inhabiting pests in fields and pastures. Figures are given of the feeding value of *Lachnosterna* and *Melolontha* adults and larvae, and also for the value of the manure produced. Objections to the use of pigs in grub-infested ground are dealt with, and the advantages summarized are (1) Eradication of grubs which might otherwise destroy the crops planted on the ground; (2) Value of the grubs as pig-feed, which is comparable with feeds costing 25 to 35 dollars per ton; (3) Value of the manure distributed over the land which, according to the experts of the Federal Bureau of Animal Industry, is worth 3.29 dollars a ton. It should be noted that the white grub-infested areas are said to average 106,680 grubs or 235 pounds of grubs to the acre, which have a food value of more than three dollars.—G. W. G.

Winter, Plants and the. Anon. (*Irish Gard.* xii., Oct. 1917, pp. 150-151).—A list of the choicer plants which came through the winter of 1916-17 at the Royal Gardens, Glasnevin, Dublin. It is of considerable value to those who are making new collections of hardy plants, or renovating old collections.—E. T. E.

Winter, The Severe: its Effect on Some of the Newer Plants and Shrubs. By George Dillistone (*Gard.*, p. 107, March 31, 1917; and p. 115, April 7, 1917).—For comparison a few of the well-known shrubs that have suffered may be mentioned. The Escallonias appear the worst, the best of which are bad. Every leaf on *E. macrantha*, *E. exoniensis*, *E. Ingramii*, and *E. langleyensis* is brown, and the later autumn growths affected. *Choisya ternata* has suffered severely, and all the *Ceanothus* more or less. *Rosmarinus officinalis*, *Hypericum calycinum* (Rose of Sharon) and *Cotoneaster microphylla* look sick and miserable.

Of the Chinese Primulas, especially those collected by Forrest 1913-16, *P. conica* is evidently an absolutely safe plant; so are *P. nutans*, *P. secundiflora*, and *P. vincaeflora*. *P. helodoxa* is quite a success, no plant in the open having suffered, but the foliage of a few wintering in a cold frame turned dark, afterwards recovering. *P. pulchella* is the only new primrose claimed as hardy which is not going to prove of much use in the garden. *P. membranifolia*, *P. spicata*, and *P. vittata*, though not so severely tried, have come through well, also *Aster staticeifolius*, *Salvia digitaloides*, and *Saxifraga Delavayi*, other new plants collected by Forrest. In the Berberises the evergreen varieties have suffered most, and the larger the leaf the more it is affected. This is also the case with the *Cotoneasters*. Unscathed are *Berberis Wilsonae*, *B. subcaulata*, *B. aggregata*, and among the evergreens *B. Sargentiana* and *B. brevipaniculata*. *B. candidula*, *B. Gagnepainii*, and *B. verruculosa*. Those showing signs of distress are *B. Knightii*, *B. pruinosa*, all the *stenophylla* hybrids, *diversifolia*, *erecta*, *Irwinii*, *latifolia*, and *reflexa*.

Three *Cotoneasters* unaffected are *C. adpressa*, *C. applanata*, and *C. pannosa*, but *C. humifusa* was badly treated by the wind. *C. congesta* and *C. pyrenaica* suffered in a less degree, while the older *C. microphylla* and *C. thymifolia* lost most of their leaves.

Of the *Cytisuses* *C. Beanii* and *C. Dallimorei* have stood with impunity. *Davidia involucrata* has survived without harm. *Erica arborea*, *E. lusitanica* (*codonodes*), and *E. Veitchii*, thought to be of doubtful hardiness, have come through practically untouched. *Hypericum empetrifolium* has nearly succumbed, but *Ligustrum Delavayanum* and *L. Henryi* have proved safe plants, so has *Lonicera nitida*.

The *Olearias* *macrodonata*, *moschata*, and *stellulata* are untouched, but *Oroschamnus rosmarinifolius* and *Rhamnus Perrieri* resent the keen wind. *Sarcococca ruscifolia* is unaffected, but *Stranvaesia undulata* has suffered, and *Veronica diosmaefolia* looks very bad. The *Viburnums* *Carlesii*, *dilatatum*, *Henryi*, *macrocephalum*, *plicatum*, and *rhytidophyllum* are unharmed.

These observations were made at Colchester.—H. R. D.

Wireworm Trapping. By E. H. Jenkins (*Gard.* May 19, 1917, p. 172).—Sliced carrots and potatoes were found of doubtful value, many more wireworms being found in the potato tubers not intended for them than in the prepared bits that were. The most effectual trap known to the author is a young Chrysanthemum. On soil treated with a soil-fumigant four times above the prescribed strength, young Chrysanthemums were planted with a view to getting a crop of flowers later. Instead he got one of wireworms, a dozen to a score on many plants. The crop of Chrysanthemums did more to rid the ground of the pest than anything. The Chrysanthemums will not interfere with the potatoes.

(*Gard.* June 2, 1917, p. 195).—Mr. Ernest A. White, Coollegreen, Waterford, finds a good dressing of salt mixed with soot the best remedy.—*H. R. D.*

FORM OF RECOMMENDATION.

For List of Fellows' Privileges see over leaf.

THE ROYAL HORTICULTURAL SOCIETY.

Established
A.D. 1804.



Incorporated
A.D. 1809.

VINCENT SQUARE, WESTMINSTER, S.W. 1

Telegram: "HORTENSIA, 'SOWEST, LONDON."

Telephone No.: 5363 VICTORIA.

**Form of Recommendation for a FELLOW of the
ROYAL HORTICULTURAL SOCIETY.**

Name

Description

Address

being desirous of becoming a FELLOW of the ROYAL HORTICULTURAL
SOCIETY, we whose Names are underwritten beg leave to recommend
him (her) to that honour ; he (she) is desirous of subscribing *
Guineas a year.

Proposed by

Seconded by

* Kindly enter here the word *four* or *two* or *one*.

It would be a convenience if the Candidate's Card were sent at the same
time.

Signed on behalf of the Council, this day of 191

..... CHAIRMAN.

THE ROYAL HORTICULTURAL SOCIETY

Vincent Square, Westminster, London, S.W.1

Privileges of Fellows.

- 1.—Anyone interested in Horticulture is eligible for election, and is invited to become a Fellow.
- 2.—Candidates for election are proposed by two Fellows of the Society.
- 3.—Ladies are eligible for election as Fellows of the Society.
- 4.—The Society being incorporated by Royal Charter, the Fellows incur no personal liability; whatsoever beyond the payment of their annual subscriptions.
- 5.—Forms for proposing new Fellows may be obtained from the Offices of the Society, Vincent Square, Westminster, S.W.
- 6.—If desired, the Secretary will, on receipt of a letter from a Fellow of the Society suggesting the name and address of any lady or gentleman likely to become Fellows, write and invite them to join the Society.

FELLOWS.

A Fellow subscribing Four Guineas a year (or commuting for Forty Guineas) is entitled—

- 1.—To ONE Non-transferable (personal) Pass and FIVE Transferable Tickets admitting to all the Society's Exhibitions, and to the Gardens.
- 2.—To attend and vote at all Meetings of the Society.
- 3.—To the use of the Libraries at the Society's Rooms.
- 4.—To a copy of the Society's JOURNAL, containing the Papers read at all Meetings and Conferences. Reports of trials made at the Gardens, and descriptions and illustrations of new or rare plants, &c.
- 5.—To purchase, at reduced rates, such fruit, vegetables, and cut flowers as are not required for experimental purposes.
- 6.—To a share (in proportion to the annual subscription) of such surplus or waste plants as may be available for distribution. Fellows residing beyond a radius of 35 miles from London (by the A B C Railway Guide) are entitled to a double share.
- 7.—Subject to certain fees and limitations, to obtain Analysis of Manures, Soils, &c., or advice on such subjects, by letter from the Society's Consulting Chemist, Dr. J. A. Voelcker, M.A., F.R.S.
- 8.—To have their Gardens inspected by the Society's Officer at the following fees:—One day, £3.3s.; two days, £5.5s.; plus all out of pocket expenses.
- 9.—To exhibit at all Shows and Meetings, and to send seeds, plants, &c., for trial at the Society's Gardens.
- 10.—To recommend any ladies or gentlemen for election as Fellows of the Society.

A Fellow subscribing Two Guineas a year (or commuting for Twenty-five Guineas) is entitled—

- 1.—To ONE Non-transferable Pass and Two Transferable Tickets.
- 2.—To the same privileges as mentioned in Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10, as above.

A Fellow subscribing One Guinea a year, with an Entrance Fee of £1. 1s. (or commuting for Fifteen Guineas) is entitled—

- 1.—To ONE Transferable Ticket (in lieu of the non-transferable personal Pass), and the privileges mentioned in Nos. 2, 3, 4, 5, 6, 7, 8, 9, 10, as above.
[*Bond fide* Gardeners earning their living thereby, and persons living permanently abroad, are exempt from the payment of the Entrance Fee.]
N.B.—Each Transferable Ticket or Non-transferable personal pass will admit three persons to the Gardens at Wisley on any day except days on which an Exhibition Meeting is being held, when each Ticket or Pass will admit One Person only. The Gardens are closed on Sundays, Good Friday, and Christmas Day.

ASSOCIATES.

An Associate subscribing 10s. 6d. a year is entitled—

- 1.—To ONE Non-transferable Pass, and to privileges as mentioned in Nos. 3, 4, and 9.
N.B.—Associates must be *bond fide* Gardeners, or employees in a Nursery, Private or Market Garden, or Seed Establishment, and must be recommended for election by Two Fellows of the Society.

EXTRACTS FROM THE PROCEEDINGS
OF THE
ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

JULY 3, 1917.

Mr. F. J. HANBURY in the Chair.

Fellows elected (22).—F. Agar, A. Allum, Miss M. D. Barlow, W. Barrett, G. P. Harris, C. H. Hawkins, A. Hide, S. E. Higgins, Lady Violet Horden, Mrs. I. Naylor, H. R. Oubridge, Admiral Primrose, Lady Rathcledan, Rev. Rochford-Wade, Mrs. Rochford-Wade, Miss Wilmot Rogers, Hon. Mrs. Sandbach, A. Sandbach, Mrs. Eva Scott, M. Silverston, Mrs. A. C. Towers, George T. Walch.

GENERAL MEETING.

JULY 17, 1917.

Mr. W. H. DIVERS, V.M.H., in the Chair.

Fellows elected (20).—M. Bennetts, Mrs. E. M. Blair, H. W. S. Chilcott, J. M. Crawford, Miss W. Donald, W. Duckworth, R. S. Gardiner, T. Gibbins, F. E. Hibbs, Miss D. G. Howes, J. Huss, Mrs. Jackson, Rev. J. A. McKenzie, T. G. Marlow, F. T. O'Leary, R. F. Parker, Mrs. Spence, J. C. Thomas, F. W. Welch, Rev. G. H. Wilson.

A lecture on "Mildew Resistant Roses" was given by Mr. Walter Easlea (see p. 253).

GENERAL MEETING.

JULY 31, 1917.

Mr. E. A. BUNYARD, F.L.S., in the Chair.

Fellows elected (17).—J. Christmas, J. D. Cornack, F. Evans, Major F. C. Ferguson, C. Gillard, J. F. Harrison, J. A. Lawrenson, W. F. McCash, Mrs. A. L. Morgan, C. H. Oldham, J. Powell, C. E. Salmon, L. Schaverim, W. F. Shaw, Bishop of Southwark, G. E. Wilson, R. F. Wootton.

Affiliated Societies (1).—West Bridgford Allotment Holders' Association.

A lecture on the "Lorette System of Pruning" was given by Dr. H. E. Durham (see p. 261).

EXHIBITION OF HARDY BRITISH-GROWN FLOWER BULBS.

JULY 31, 1917.

Class 3. Amateurs.—Collection of Dry Home-grown Hardy Flower Bulbs, in not more than 20 varieties, of which 7 at least must be *Daftodils*; and not more than 15 or less than 10 bulbs of any one variety.

First Prize, £2 10s.; Second, £1 10s.; Third, £1.

NOTE.—An exhibitor in Class 3 was not allowed to exhibit in Class 4.

No entries.

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Class 4. Amateurs.—Collection of Dry Home-grown Hardy Flower Bulbs, in not more than 10 varieties, of which 5 at least must be Daffodils; and not more than 15 or less than 10 bulbs of any one variety.

First Prize, £2 10s.; Second, £1 10s.; Third £1.

1. G. Stocks, Esq., 44 Bentley Road, Doncaster.
 3. Miss V. Warren, The Oaks, Westbere, Canterbury.
- No second awarded.

Class 5. Open.—Collection of Dry Home-grown Daffodil Bulbs—'Single' Bulbs, in not more than 20 varieties nor more than 20 bulbs of any one variety; in a space 10 ft. by 3 ft.

Silver-gilt Banksian Medal.

Messrs. J. R. Pearson, The Nurseries, Lowdham.

Silver Flora Medal.

Messrs. Bath, Floral Farms, Wisbech.

Silver Banksian Medal.

Messrs. Hogg & Robertson, 22 St. Mary Street, Dublin.

Bronze Banksian Medal.

Mr. J. Mallender, Scrooby, Bawtry.

Class 6. Open.—Collection of Dry Home-grown Daffodils—'Cluster or Family' bulbs, in not more than 20 varieties nor more than 20 clusters of any one variety.

No entries.

Class 7. Open.—Collection of Dry Home-grown Bulbs of Market Varieties of Daffodils—'Single' Bulbs—in 10 varieties, 20 bulbs of each, to include 'Emperor,' 'Empress,' 'Sir Watkin,' 'Victoria,' 'Barrii conspicuus,' and 'Poeticus ornatus,' in a space 7 ft. by 3 ft.

Silver-gilt Banksian Medal.

Messrs. Bath.

Silver Flora Medal.

Mr. Mallender.

Class 8. Open.—Collection of Dry Home-grown Bulbs of Market Varieties of Daffodils—'Cluster or Family' Bulbs—in 10 varieties, 20 clusters of each, to include 'Emperor,' 'Empress,' 'Sir Watkin,' 'Victoria,' 'Barrii conspicuus,' and 'Poeticus ornatus.'

No entries.

Class 9. Open.—Collection of Dry Home-grown Tulip Bulbs, in not more than 20 varieties, nor more than 20 bulbs of any one variety, in a space 10 ft. by 3 ft.

Silver-gilt Banksian Medal.

Messrs. J. R. Pearson.

Silver Flora Medal.

Messrs. Geo. Monro, Jr., The Maltings, Spalding, Lincs.

Silver Banksian Medal.

Messrs. Hogg & Robertson.

Silver Banksian Medal.

Messrs. Bath.

Class 10. Open.—Collection of any Dry Home-grown Hardy Flower Bulbs other than Daffodils and Tulips. Not more than 30 varieties, nor more than 30 or less than 20 bulbs of any one variety. Diversity of Genera and Species will be favourably considered by the judges; in a space 12 ft. by 3 ft.

Silver-gilt Banksian Medal.

Messrs. Barr, King Street, Covent Garden, W.C.

Silver Flora Medal.

Messrs. Hogg & Robertson.

R.H.S. VEGETABLE MEETING.

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GENERAL MEETING.

AUGUST 14, 1917.

Mr. J. CHEAL, V.M.H., in the Chair.

Fellows elected (24).—D. Barnard, Robt. Barr, F. E. Bartlett, E. F. Benton, Miss M. H. Beveridge, A. P. Blacklea, S. W. Choriton, Herbert Collins, W. H. Cowell, Thomas England, M. Feeney, A. S. Fidler, E. B. Foweraker, James Guy, W. M. Hale, George Hill, C. W. H. Iago, G. E. Millard, L. Morgan, P. R. Morris, Leonard Nichols, Miss G. L. Peirse-Duncombe, F. H. Wheeler, W. Y. Wyndham.

Affiliated Societies (1).—Chadwell Heath Amateur Gardeners' Society.
A lecture was given on "Water Gardening" by Mr. R. W. Wallace (see p. 278).

GENERAL MEETING.

AUGUST 28, 1917.

Mr. E. H. JENKINS in the Chair.

Fellows elected (10).—Miss Bennison, Mrs. Chappell, F. J. Crickland, Mrs. F. A. Crisp, Miss A. Hunt, L. E. Snelgrove, Mrs. F. A. Talbot, T. F. Thorogood, F. M. Vokes, W. R. Williams.

Fellows resident abroad (1).—Lt. Georges Truffaut.
Affiliated Societies (2).—Llandudno Allotment Holders' Association, Sholing Amateur and Cottage Gardeners' Improvement Association.
A lecture on "Guides to the Manuring of Garden Crops" was given by Mr. H. E. P. Hodson, F.C.S. (see p. 346).

GENERAL MEETING.

SEPTEMBER 11, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair.

Fellows elected (4).—F. G. Benbow, Miss C. M. Kennedy, J. P. O'Reilly, Thomas Smith.

Affiliated Societies (1).—Foots Cray and North Cray Horticultural Society.
A lecture on "The Planting of Shrubs for Autumn Colour Effects" was given by Mr. C. R. Fielder, V.M.H. (see p. 340).

R.H.S. VEGETABLE MEETING.

SEPTEMBER 25, 1917.

Class 1.—Twelve kinds distinct, to be selected from the subjoined list.
Beet, Brussels Sprouts, Cabbage, Broccoli or Cauliflower, Carrots, Celery, Cucumbers, Endive, Leeks Lettuce, Mushrooms, Onions, Parsnips, Peas, Potatoes, Tomatoes, Turnips, Beans (Runner or French), Vegetable Marrow.

First Prize, The Sutton Challenge Cup (value £21) and £5; Second, £4; Third, £3.

1. W. H. Myers, Esq., Swanmore, Bishops Waltham (gr. G. Ellwood).
2. T. Jones, Esq., Bryn, Penylan, Ruabon.
3. E. Matthews, Esq., Stratfieldsaye, Mortimer R.S.O., Berks.

Class 2.—Nine kinds distinct, to be selected from the list in Class 1. The object of this Class is to illustrate not only those vegetables which are in daily use, but especially the quality and size in which they are most acceptable and useful for table use, and possess the qualities most valued for table use by cooks.

First Prize, The Gordon Lennox Challenge Cup and £4; Second, £3; Third, £2.

1. E. E. Palmer, Esq., Drayton House, Sherfield on Loddon, Basingstoke (gr. H. E. Wallis).
2. Hon. Mrs. Greville, Polesden Lacy, Dorking (gr. H. Prince).
3. Mrs. M. Knox, Hall Hatch, nr. Alton (gr. W. West).

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Class 3.—Six kinds distinct, to be selected from the list in Class 1.

First Prize, £3 ; Second, £2 ; Third, £1.

1. Miss E. L. Bradshaw, The Grange, Steeple Aston, Oxon. (gr. R. Wadham).
2. G. Thorn, Esq., Sprotlands, Willesborough, Ashford (gr. M. Hoad).
3. Sir M. Turner, Bedford, Havering, Romford (gr. A. J. Barrett).

Class 4.—Potatos, collection of 12 varieties distinct.

First Prize, £3 ; Second, £2 ; Third, £1.

1. J. B. Fortescue, Esq., Dropmore, Maidenhead (gr. C. Page).
2. Mrs. A. Smart, Coverpoint, Llansannan, Abergele (gr. R. Rogers).

Class 5.—Potatos, collection of 6 varieties distinct.

First Prize, £1 10s. ; Second, £1 ; Third, 10s.

Competitors in Class 4 were not allowed to enter in 5.

1. G. Thorn, Esq.
2. W. H. Myers, Esq.
3. Sir M. Turner.

Class 6.—Onions, collection of 6 varieties distinct, as follows :—

Two dishes of the ' Ailsa Craig ' type, one oval and the other round ; one dish of Red Onions ; one dish of Silverskins ; one dish of James' or other selection of long-keeping brown globe Onions ; one dish of White Spanish or Nuneham Park type (flat, not globe).

N.B.—More than 2 dishes of selections of ' Ailsa Craig ' type, or varieties indistinguishable from it disqualified.

First Prize, £2 ; Second, £1 ; Third, 10s.

1. W. H. Myers, Esq.
2. E. E. Palmer, Esq.
3. Mrs. Jenner, Wenvoe Castle, nr. Cardiff (gr. H. Wheeler).

Class 7.—Salads, collection of 6 kinds distinct, each kind to be staged separately.

First Prize, £2 ; Second, £1 ; Third, 15s.

1. W. H. Myers, Esq.
2. Miss Bradshaw.
3. E. Matthews, Esq.

Single Dish Classes for Amateurs.

In Classes 8–38 the First Prize is in each case 10s., the Second, 7s. 6d., Third, 5s.

The specimens shown in each Class must be always of one and the same variety.

Class 8.—Beans, Scarlet Runners.

1. Miss Bradshaw.
2. Sir M. Turner.
3. Hon. Mrs. Greville.

Class 9.—Beans, French Climbing.

1. E. Matthews, Esq.
2. Mrs. Knox.
3. G. Thorn, Esq.

Class 10.—Beans, French Dwarf.

1. E. Matthews, Esq.
2. Sir M. Turner.
3. Mrs. Knox.

Class 11.—Beet, Globe type.

1. Mrs. Jenner.
2. R. Staward, Esq., The Gardens, Panshanger, Hertford.
3. Miss Bradshaw.

Class 12.—Beet, Long type.

1. Sir M. Turner.
2. E. E. Palmer, Esq.
3. T. Jones, Esq.

Class 13.—Brussels Sprouts, 50 buttons.

1. T. Jones, Esq.
2. W. H. Myers, Esq.
3. Miss Bradshaw.

Class 14.—Brussels Sprouts, 3 plants.

1. R. Staward, Esq.
2. W. H. Myers, Esq.
3. E. Matthews, Esq.

Class 15.—Cabbage.

1. Hon. Mrs. Greville.
2. E. E. Palmer, Esq.
3. G. Thorn, Esq.

Class 16.—Cabbage, Savoy.

1. E. E. Palmer, Esq.
2. Hon. Mrs. Greville.
3. Sir D. Gooch, Bt., Hylands, Writtle, Essex (gr. W. Heath).

Class 17.—Cauliflower or Broccoli.

1. T. Jones, Esq.
2. E. Matthews, Esq.
3. W. H. Myers, Esq.

Class 18.—Celeriac.

1. W. H. Myers, Esq.
2. Miss Bradshaw.
3. R. Staward, Esq.

Class 19.—Celery, white.

1. T. Jones, Esq.
2. Miss Bradshaw.
3. Hon. Mrs. Greville.

Class 20.—Celery, Red.

1. T. Jones, Esq.
2. W. H. Myers, Esq.
3. Hon. Mrs. Greville.

Class 21.—Cucumbers.

1. E. E. Palmer, Esq.
2. T. Jones, Esq.
3. W. H. Myers, Esq.

Class 22.—Leeks.

1. T. Jones, Esq.
2. W. H. Myers, Esq.
3. E. Matthews, Esq.

Class 23.—Marrows.

1. T. Jones, Esq.
2. Miss Bradshaw.
3. R. Staward, Esq.

Class 24.—Mushrooms.

1. Not awarded.
2. Hon. Mrs. Greville.

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Class 25.—Onions.

1. Mrs. Jenner.
2. E. E. Palmer, Esq.
3. W. H. Myers, Esq.

Class 26.—Parsnips.

1. Miss Bradshaw.
2. E. E. Palmer, Esq.
3. E. Matthews, Esq.

Class 27.—Carrots, Long.

1. Miss Bradshaw.
2. T. Jones, Esq.
3. E. E. Palmer, Esq.

Class 28.—Carrots, stump-rooted or short.

1. T. Jones, Esq.
2. Miss Bradshaw.
3. E. E. Palmer, Esq.

Class 29.—Peas.

1. E. Matthews, Esq.
2. T. Jones, Esq.
3. E. E. Palmer, Esq.

Class 30.—Turnips, white skin and flesh.

1. T. Jones, Esq.
2. E. E. Palmer, Esq.
3. Mrs. M. Knox.

Class 31.—Turnips, purple-top, red-top, or green-top, flesh white.

1. Miss Bradshaw.
2. Hon. Mrs. Greville.
3. R. Staward, Esq.

Class 32.—Turnips, yellow flesh.

1. T. Jones, Esq.
2. R. Staward, Esq.
3. Sir M. Turner.

Class 33.—Potatos, white.

1. G. Thorn, Esq.
2. E. Matthews, Esq.
3. J. B. Fortescue, Esq.

Class 34.—Potatos, coloured.

1. W. H. Myers, Esq.
2. G. Thorn, Esq.
3. Mrs. M. Knox.

Class 35.—Kale, Curled.

1. E. Matthews, Esq.
2. Hon. Mrs. Greville.
3. E. E. Palmer, Esq.

Class 36.—Tomatos, Red.

1. Miss Bradshaw.
2. G. Thorn, Esq.
3. E. Matthews, Esq.

Class 37.—Tomatos, Yellow.

1. T. Jones, Esq.
2. Miss Bradshaw.
3. R. Staward, Esq.

MEETING FOR BRITISH-GROWN FRUITS, 1917. lxxxiii

Class 38.—Any other Vegetable not named in the Schedule.

1. Miss Bradshaw.
2. E. E. Palmer, Esq.
3. Mrs. M. Knox.

CHAMPION CHALLENGE CUP.

The Champion Cup will be held for one year (subject to a guarantee of its return in good condition) by the winner of the greatest number of First Prize points throughout the whole meeting, the winner in Class 1 being excluded. An Exhibitor may win this Cup only once in three years, but the winner may compete the following year, and if adjudged first in these two successive years will receive a smaller commemorative Cup. In calculating for this Champion Cup the number of points reckoned for each First Prize will be as follows :

| | | | | | | | |
|-------------------|---|---|---|---|---|---|----------|
| Class 2 | . | . | . | . | . | . | 9 points |
| Classes 3, 4 | . | . | . | . | . | . | 6 " |
| Classes 5, 6, 7 | . | . | . | . | . | . | 4 " |
| All other classes | . | . | . | . | . | . | 1 point |

In case of an equality (and only in that case) Second Prizes will be counted in order to arrive at a decision, each Second Prize counting half the points allotted to the First Prize.

Miss Bradshaw, The Grange, Steeple Aston, Oxon. (gr. R. Wadham).

GENERAL MEETING.

OCTOBER 9, 1917.

Sir HARRY J. VEITCH, F.L.S., V.M.H., in the Chair.

Fellows elected (41).—R. H. Adie, Mrs. A. Ashworth, H. C. Barnard, T. B. Briggs, S. P. Burghall, J. Campbell, Mrs. W. Campbell, J. B. Clapham, C. E. Coghill, P. Crossley, F. E. Evans, M. W. Fox-Strangeways, A. S. Galt, Miss F. S. Gardner, J. E. Goodson, Miss A. Green, W. J. Hande, M. Harris, C. Hooper, H. Hulland, W. Jones, F. Keeling, J. Kent, F. J. Lume, Miss Martens, H. S. Melbourne, B. Moirer, Major C. A. H. Palairer, Capt. A. Palmer, P. S. Patrick, A. E. Pearce, E. Riddell, W. H. Shankland, T. B. Short, Miss A. Smith, W. B. Tidman, Mrs. E. Tyrwhitt-Drake, Mrs. Walford, H. H. Warner, Lieut.-Col. Wayland, Miss K. M. Wyldes.

Fellows resident abroad (5).—D. C. Amin, H. C. Javaraya, E. Jenkins, D. Newbronner, Miss H. Loines.

Associates (1).—H. Innes.

Affiliated Societies (3).—Harrow and District Allotment Gardeners' Association, Northend Croydon Brotherhood Horticultural Allotment Association, Wealdstone and District Allotment and Food Association.

MEETING FOR BRITISH-GROWN FRUITS, 1917.

OCTOBER 9, 1917.

DIVISION I.

FRUITS GROWN UNDER GLASS OR OTHERWISE.

OPEN TO AMATEURS AND GARDENERS ONLY.

Class 1.—Collection of 9 dishes of ripe dessert fruit :—6 kinds at least ; only 1 Pine, 1 Melon, 1 Black and 1 White Grape, allowed ; not more than 2 varieties of any other kind, and no two dishes of the same variety.

First Prize, Silver Hogg Medal and £5 ; Second, £4 ; Third, £3.

1. Lord Somers, Eastnor Castle, Ledbury (gr. G. Mullins).
2. Duke of Newcastle, Clumber, Worksop (gr. S. Barker).
3. C. A. Cain, Esq., The Node, Welwyn, Herts (gr. T. Pateman).

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Class 2.—Collection of 6 dishes of ripe dessert fruit :—4 kinds at least ; only 1 Melon, 1 Black and 1 White Grape, allowed ; not more than 2 varieties of any other kind and no two dishes of the same variety. Pineapples excluded.

First Prize, Silver Knightian Medal and £3 ; Second, £2 ; Third, £1 10s.

1. Lord Hillingdon, Wildernes, Sevenoaks (gr. J. Shelton).
2. E. Matthews, Esq., Stratfieldsaye, Mortimer, Berks.
3. F. R. Rodd, Esq., Trebartha Hall, Launceston (gr. F. A. Billings).

Class 3.—Grapes, 6 distinct varieties (2 bunches of each), of which two at least must be White.

First Prize, Silver Hogg Medal and £3 ; Second, £4 ; Third, £3.

1. Duke of Newcastle.
2. G. Miller, Esq., Newberries, Radlett (gr. J. Kidd).
3. Lord Hastings, Melton Constable, Norfolk (gr. J. G. Besant).

Class 4.—Grapes, 4 varieties (2 bunches of each), selected from the following, 'Madresfield Court,' 'Prince of Wales,' 'Muscat Hamburgh,' 'Muscat of Alexandria' or 'Canon Hall' (not both), 'Mrs. Pearson,' and 'Dr. Hogg.'

First Prize, Silver Knightian Medal and £3 ; Second, £2 ; Third, £1 10s.

No entries.

Class 5.—Grapes, 'Black Hamburgh,' 2 bunches.

First Prize, £2 ; Second, £1 10s. ; Third, £1.

1. Lord Hillingdon.
2. Duke of Newcastle.
3. E. Matthews, Esq.

Class 6.—Grapes, 'Mrs. Pince,' 2 bunches.

First Prize, £2 ; Second, £1 10s.

1. Lord Hillingdon.
2. Duke of Newcastle.

Class 7.—Grapes, 'Alicante,' 2 bunches.

First Prize, £2 ; Second, £1 10s.

1. Lord Hillingdon.
2. Lord Somers.

Class 8.—Grapes, 'Madresfield Court,' 2 bunches.

First Prize, £2 ; Second, £1 10s.

1. Not awarded.
2. Lord Hastings.

Class 9.—Grapes, 'Prince of Wales,' 2 bunches.

First Prize, £2 ; Second, £1 10s.

1. Not awarded.
2. G. Meyer, Esq.

Class 10.—Grapes, any other Black Grape, 2 bunches. (The name of the variety must be stated.)

First Prize, £2 ; Second, £1 10s.

1. Duke of Newcastle.
2. Lord Hastings.

Class 11.—Grapes, 'Muscat of Alexandria,' 2 bunches.

First Prize, Silver Knightian Medal and £2 ; Second, £2 ; Third £1 10s.

1. Duke of Newcastle.
2. S. P. Emanuel, Esq., Oatlands Lodge, Weybridge (gr. J. Lock).
3. Lord Hastings.

Class 12.—Grapes, any other White Grape, 2 bunches. (The name of the variety must be stated.)

First Prize, £2 ; Second, £1 10s.

1. Lord Somers.
2. Duke of Newcastle.

MEETING FOR BRITISH-GROWN FRUITS, 1917. lxxxv

Class 13.—Collection of Hardy Fruits, in a space not exceeding 12×3. Thirty dishes distinct, grown entirely in the open; not more than 12 varieties of Apples or 8 of Pears.

First Prize, Silver Hogg Medal and £2; Second, £2.

1. Mr. R. Staward, The Gardens, Panshanger, Herts.
2. Lord Somers.

DIVISION II.

FOR FRUIT GROWN ENTIRELY OUT OF DOORS.

OPEN TO NURSERYMEN ONLY.

Class 14.—30 feet run of 6 feet tabling. Exhibitors were allowed to show in one only of these classes.

Gold Knightian Medal.

Mr. J. C. Allgrove, Middle Green, Langley, Slough.

Gold Medal.

Messrs. Bunyard, Royal Nurseries, Maidstone.

Silver-gilt Knightian Medal.

Messrs. Cannell, The Nurseries, Eynesford, Kent.

Silver Knightian Medal.

Mr. Notcutt, Woodbridge.

Silver Banksian Medal.

Messrs. Seabrook, The Nurseries, Chelmsford.

Class 15.—20 feet run of 6 feet tabling.

Gold Medal.

Messrs. Spooner, The Nurseries, Hounslow.

Silver-gilt Hogg Medal.

Messrs. Cheal, Crawley, Sussex.

Silver-gilt Banksian Medal.

Barnham Nurseries, Barnham Junction, Sussex.

Silver Knightian Medal.

Mr. H. Close, Littlecroft, Orpington.

Silver Banksian Medal.

Mr. E. Parsons, Worcester.

DIVISION III.

OPEN TO MARKET GROWERS ONLY.

Class 16.—Apples, 20 baskets of (cooking and dessert, distinct). Fruit suitable for market purposes will have more consideration than a large number of varieties. The size of the baskets limited to half-bushels if round, to grape (baby) baskets if rectangular.

Silver Cup.

Lt.-Col. Lumley Webb, Ham Green, Upchurch, Sittingbourne.

DIVISION IV.

FRUITS GROWN ENTIRELY IN THE OPEN AIR.

OPEN TO GARDENERS AND AMATEURS ONLY.

Class 17.—Apples, 24 dishes distinct, 16 cooking, 8 dessert. The latter to be placed in the front row.

First Prize, Fruiterers' Company Silver-gilt Medal and £3; Second, £3;
Third, £2.

1. C. A. Cain, Esq.

2. Lord Somers.

3. J. Liddell, Esq., Sherfield Manor, Basingstoke (gr. R. Learmouth).

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Class 18.—Apples, 12 dishes distinct, 8 cooking, 4 dessert. The latter to be placed in the front row.

First Prize, Fruiterers' Company Silver Medal and £2; Second, £1.

1. G. Miller, Esq.
2. Mr. F. G. Gerrish, Pendley Manor Gardens, Tring.

Class 19.—Cooking Apples, 6 dishes distinct.

First Prize, £1; Second, 15s.

1. C. A. Cain, Esq.
2. Mr. F. G. Gerrish.

Class 20.—Dessert Apples, 6 dishes distinct.

First Prize, £1; Second, 15s.

1. Mr. F. G. Gerrish.
2. Lord Somers.

Class 21.—Dessert Pears, 18 dishes distinct.

First Prize, Silver-Gilt Knightian Medal and £2; Second, £2; Third, £1.

1. J. Liddell, Esq.
2. C. A. Cain, Esq.
3. Dr. Jackson, Thornton Heath (gr. W. Paulty).

Class 22.—Dessert Pears, 9 dishes distinct.

First Prize, £1 10s.; Second, £1.

1. Lord Somers.
2. Lord Hillingdon.

Class 23.—Plums, 3 dishes distinct.

First Prize, £1; Second, 10s.

1. C. H. Berners, Esq., Woolvestone Park, Ipswich (gr. W. Messenger).
2. J. Liddell, Esq.

Class 24.—Damsons, or Bullaces, 3 dishes distinct.

First Prize, 10s.; Second, 7s. 6d.

1. Mr. F. G. Gerrish.

Class 25.—Morello Cherries, 50 fruits.

First Prize, 7s.; Second, 5s.

1. Lord Somers.
2. F. R. Rodd, Esq.

Class 26.—Autumn Raspberries, 1 dish of 50 fruits.

First Prize, 7s.; Second, 5s.

1. E. E. Palmer, Esq.

DIVISION V.

SPECIAL DISTRICT COUNTY PRIZES.

OPEN TO GARDENERS AND AMATEURS ONLY; ALL FRUIT EXHIBITED MUST HAVE BEEN GROWN ENTIRELY IN THE OPEN.

AA. Apples, six dishes distinct, four cooking, two dessert.

First Prize, £1, and 3rd Class single fare from Exhibitor's nearest railway station to London.

Second Prize, 15s. and railway fare as above.

BB. Pears, Dessert, six dishes distinct.

First Prize, £1 10s. and railway fare as above.

Second Prize, £1 and railway fare as above.

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Class 27.—Open only to Kent growers.

- AA. { 1. Rev. J. R. Leigh, Vicarage, Yalding, Kent (gr. G. Johnson).
2. Rev. H. A. Bull, Wellington House, Westgate-on-Sea (gr. F. King).
BB. { 1. Bull, Rev. H. A.
2. Leigh, Rev. J. R.

Class 28.—Open only to growers in Surrey, Sussex, Hants.

- AA. { 1. W. H. Smith, Esq., West Dean Park, Chichester.
2. Rev. McMurdie, Woburn Park, Weybridge (gr. A. Basile).
BB. { 1. Rev. McMurdie.
2. E. E. Palmer, Esq.

Class 29.—Open only to growers in Wilts, Dorset, Somerset, Devon, and Cornwall.

- AA. { 1. Major Wingfield-Digby, Sherborne Castle, Dorset (gr. T. Turton).
2. John Copp, Esq., Ferndale, Teignmouth, S. Devon.
BB. { 1. Major Wingfield-Digby.
2. Lady M. Morrison.

Class 30.—Open only to growers in Gloucester, Oxford, Bucks, Berks, Beds, Herts, and Middlesex.

- AA. { 1. Sir Edward Pearson, Brickendonbury, Hertford (gr. W. Stephenson)
No second.
BB. { 1. Sir E. Pearson.
No second.

Class 31.—Open only to growers in Essex, Suffolk, Norfolk, Cambridge, Hunts, and Rutland.

- AA. { 1. C. H. Berners, Esq.
2. Sir R. Shafto Adair, Bt., Flixton Hall, Bungay.
BB. { 1. Sir R. Shafto Adair, Bt.
2. C. H. Berners, Esq.

Class 32.—Open only to growers in Lincoln, Northampton, Warwick, Leicester, Notts, Derby, Staffs, Shropshire, and Cheshire.

- AA. { 1. Mark Firth, Esq., Carlton Park, Market Harboro' (gr. P. W. Thatcher).
No second.
BB. No entries.

Class 33.—Open only to growers in Worcester, Hereford, Monmouth, and Wales.

- AA. { 1. W. J. Gresson, Esq., Stoke House, Severn Stoke, near Worcester
(gr. T. Parry).
2. Mrs. Smart, Coverpoint, Llansannan, Abergelc (gr. R. Rogers).
BB. { 1. W. J. Gresson, Esq.
No second.

Class 34.—Open only to growers in the six northern counties of England, and in the Isle of Man.

- AA. { 1. William Orr, Esq., Woodwell, Silverdale, Lancs.
2. James Cocker, Esq., Chesters, Humshaugh, Northumberland.
BB. No entries.

Class 35.—Open only to growers in Scotland.

- AA. { 1. Captain Gordon, Threave House, Castle Douglas, Kirkcudbright (J. Duff).
No second.
BB. No entries.

Class 36.—Open only to growers in Ireland.

- AA. { 1. Earl of Bessborough, Piltown, Kilkelly (gr. T. E. Tomalin).
2. Earl of Drogheda, Moore Abbey, Monasterevan (gr. C. Pilgrim).
BB. { 1. Hugh Innes, Esq., Stewart Institute, Palmerston, Co. Dublin.
2. Earl of Bessborough.

Class 37.—Open only to growers in the Channel Islands.
No entries.

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CHOICE DESSERT APPLES.

N.B.—The Judges were instructed to prefer Quality, Colour, and Finish to mere size.

[An Exhibitor may only show one dish in each Class.]

In each class: First Prize, 7s.; Second Prize, 5s.; but when the entries exceed six in any Class the Judges may at their discretion recommend a Third Prize of 4s.

Class 38.—Adams' Pearmain.

1. E. Matthews, Esq.
2. Sir R. Shafto Adair, Bt.
3. Major Wingfield-Digby.

Class 39.—Allington Pippin.

1. A. E. Cumberbatch, Esq., Ware Park, Ware, Herts (gr. F. W. Miles).
2. Lady M. Morrison, Fonthill House, Tisbury, Wilts (gr. H. H. Mills).
3. E. Matthews, Esq.

Class 40.—American Mother.

1. E. Matthews, Esq.
2. E. E. Palmer, Esq.
3. F. C. Stoop, Esq., Westhall, Byfleet, Surrey (gr. G. Carpenter).

Class 41.—Barnack Beauty.

1. E. Matthews, Esq.
2. W. H. Smith, Esq.
3. F. C. Stoop, Esq.

Class 42.—Ben's Red.

1. C. H. Berners, Esq.
2. Rev. H. A. Bull.

Class 43.—Blenheim Orange.

1. E. E. Palmer, Esq.
2. C. H. Berners, Esq.
3. Rev. H. A. Bull.

Class 44.—Charles Ross.

1. W. J. Gresson, Esq.
2. E. Matthews, Esq.
3. G. F. Marsh, Esq., Morningside, Marchmont Road, Wallington.

Class 45.—Claygate Pearmain.

1. F. L. Lansdell, Esq., Westmoors, near Wimborne, Dorset.
2. E. Matthews, Esq.

Class 46.—Coronation.

1. F. L. Lansdell, Esq.
2. E. Matthews, Esq.
3. W. H. Lewis, Esq., Bedgebury Park, Goudhurst.

Class 47.—Cox's Orange.

1. Major Wingfield-Digby.
2. F. L. Lansdell, Esq.
3. G. F. Marsh, Esq.

Class 48.—Egremont Russet.

1. Major Wingfield-Digby.
2. E. Matthews, Esq.

Class 49.—James Grieve.

1. J. Copp, Esq.
2. W. H. Smith, Esq.
3. F. L. Lansdell, Esq.

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Class 50.—Lord Hindlip.

1. Lady M. Morrison.
2. E. Matthews, Esq.

Class 51.—Margill.

1. F. C. Stoop, Esq.
2. R. Staward.
3. Major Wingfield Digby.

Class 52.—Ribston Pippin.

1. Marquis of Ripon.
2. C. H. Berners, Esq.
3. W. H. Smith, Esq.

Class 53.—Rival.

1. Lady M. Morrison.
2. C. H. Berners, Esq.
3. Rev. J. R. Leigh.

Class 54.—St. Edmund's Pippin.

1. Major Wingfield-Digby.
2. E. Matthews, Esq.

Class 55.—Wealthy.

1. E. E. Palmer, Esq.
2. C. H. Berners, Esq.
3. Duke of Newcastle.

Class 56.—Eight fruits of any early variety, not named above, fit for use.

Four Prizes, 7s., 6s., 5s., 4s.

1. F. C. Stoop, Esq.
2. Marquis of Ripon.
3. F. West, Esq.
4. Lady Morrison.

Class 57.—Eight fruits of any late variety, not named above.

Four Prizes, 7s., 6s., 5s., 4s.

1. C. H. Berners, Esq.
2. F. C. Stoop, Esq.
3. Marquis of Ripon.
4. W. H. Smith, Esq.

Choice Cooking Apples.

Class 58.—Beauty of Kent.

1. Rev. McMurdie.
2. Major Wingfield-Digby.
3. Earl of Drogheda.

Class 59.—Bismarck.

1. Sir E. Pearson.
2. Sir M. Turner.
3. A. E. Cumberbatch, Esq.

Class 60.—Blenheim Orange (large fruits).

1. F. West, Esq.
2. Major Wingfield-Digby.
3. J. S. Kelly, Esq.

Class 61.—Bramley's Seedling.

1. E. Matthews, Esq.
2. E. E. Palmer, Esq.
3. Sir E. Pearson.

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Class 62.—Cellini.

1. Mrs. Norden.
2. G. F. Marsh, Esq.
3. E. Matthews, Esq.

Class 63.—Dumelow's Seedling, *syns.* Wellington and Normanton Wonder.

1. E. Matthews, Esq.
2. F. C. Stoop.
3. R. P. Emanuel, Esq.

Class 64.—Ecklinville.

1. E. Matthews, Esq.
2. R. Collard, Esq., Kynnersley, Shenfield, Essex.
3. J. W. Hussey, Esq.

Class 65.—Emperor Alexander.

1. Sir R. Shafto Adair, Bt.
2. Sir E. Pearson.
3. W. J. Gresson.

Class 66.—Gascoyne's Scarlet (large fruits).

1. R. Staward.
2. Duke of Newcastle.
3. Sir E. Pearson.

Class 67.—Golden Noble.

1. Sir E. Pearson.
2. Major Wingfield-Digby.

Class 68.—Grenadier.

1. Captain Gordon.
- No other prizes.

Class 69.—Hormead Pearmain.

1. E. Matthews, Esq.
2. G. F. Marsh, Esq.

Class 70.—Lane's Prince Albert.

1. A. E. Cumberbatch, Esq.
2. Lady M. Morrison.
3. E. Matthews, Esq.

Class 71.—Lord Derby.

1. Rev. J. R. Leigh.
2. E. Matthews, Esq.
3. R. Staward.

Class 72.—Mère de Ménage.

1. Sir E. Pearson.
2. E. Matthews, Esq.
3. E. E. Palmer, Esq.

Class 73.—Newton Wonder.

1. E. Matthews, Esq.
2. Wm. Hy. Lewis, Esq.
3. Rev. H. A. Bull.

Class 74.—Peasgood's Nonesuch

1. M. Firth, Esq.
2. Rev. J. R. Leigh.
3. F. West, Esq.

Class 75.—Potts' Seedling.

1. Major Wingfield-Digby.
2. R. Staward, Esq.
3. Geo. Churcher, Esq.

Class 76.—Royal Jubilee.

1. W. H. Smith.
2. Major Wingfield-Digby (gr. T. Turton).

Class 77.—Stirling Castle.

1. Marquis of Ripon.
2. E. Matthews, Esq.

Class 78.—The Queen.

1. Sir E. Pearson.
2. E. F. Palmer, Esq.
3. E. Matthews, Esq.

Class 79.—Warner's King.

1. F. West, Esq.
2. Rev. McMurdie.
3. C. H. Combe, Esq.

Class 80.—Eight fruits of any variety not named above.

Four prizes, 7s., 6s., 5s., 4s.

1. E. E. Palmer, Esq.
2. Lady M. Morrison.
3. Mark Firth, Esq.

Choice Dessert Pears.

First Prize, 7s.; Second, 5s.; but when the entries exceed six in any Class, the Judges may, at their discretion, recommend a Third Prize of 4s.

Class 81.—Beurré d'Amanlis.

1. F. West, Esq.

Class 82.—Beurré d'Anjou.

1. C. H. Combe, Esq.
2. Major Wingfield-Digby.

Class 83.—Beurré Bosc.

1. Sir R. Shafto Adair, Bt.
2. Major Wingfield-Digby.
3. Rev. McMurdie.

Class 84.—Beurré Hardy.

1. Major Wingfield-Digby.
2. Sir R. Shafto Adair.
3. C. H. Berners, Esq.

Class 85.—Beurré Superfin.

1. C. H. Berners, Esq.
2. C. H. Combe, Esq.
3. Major Wingfield-Digby.

Class 86.—Charles Ernest.

1. C. H. Berners, Esq.
2. Rev. McMurdie.
3. E. Matthews, Esq.

Class 87.—Conference.

1. G. F. Marsh, Esq.
2. C. H. Berners, Esq.
3. Rev. McMurdie.

Class 88.—Doyenné du Comice.

1. Hy. Shipley, Esq., The Bungalow, Cobham, Surrey.
2. W. H. Smith, Esq.
3. E. Matthews, Esq.

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Class 89.—Durondeau.

1. Rev. McMurdie.
2. G. F. Marsh, Esq.
3. R. Staward, Esq.

Class 90.—Easter Beurré.

1. F. West, Esq.
2. C. H. Berners, Esq.

Class 91.—Emile d'Heyst.

1. C. H. Berners Esq.
2. Duke of Newcastle.

Class 92.—Fondante d'Automne.

1. C. H. Berners, Esq.
2. C. H. Combe, Esq.
3. Hy. Shipley, Esq.

Class 93.—Fondante de Thirriot.

1. Rev. McMurdie.
2. C. H. Berners, Esq.

Class 94.—Glou Morceau.

1. Rev. McMurdie.
2. C. H. Combe, Esq.
3. Lady M. Morrison.

Class 95.—Joséphine de Malines.

1. Sir E. Pearson.
2. A. E. Cumberbatch, Esq.
3. Major Wingfield-Digby.

Class 96.—Louise Bonne of Jersey.

1. G. F. Marsh, Esq.
2. C. H. Berners, Esq.
3. Marquis of Ripon.

Class 97.—Marie Benoist.

1. Major Wingfield-Digby.
2. C. H. Berners, Esq.

Class 98.—Marie Louise.

1. Rev. McMurdie.
2. C. H. Berners, Esq.
3. Major Wingfield-Digby.

Class 99.—Nouvelle Fulvie

1. Major Wingfield-Digby.
2. A. E. Cumberbatch, Esq.

Class 100.—Pitmaston Duchess.

1. C. H. Berners, Esq.
2. Rev. McMurdie.
3. C. H. Combe, Esq.

Class 101.—Souvenir du Congrès.

1. Rev. McMurdie.
2. C. H. Berners, Esq.

Class 102.—Thompson.

No entries.

Class 103.—Triomphe de Vienne.

1. C. H. Berners, Esq.
2. Rev. McMurdie.

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Class 104.—Winter Nelis.

1. Major Wingfield-Digby.
2. G. Meyer, Esq., Whistler's Wood, Woldingham (gr. F. Norwood).

Class 105.—Eight fruits of any early variety not named above.

Four Prizes, 7s., 6s., 5s., 4s.

1. Sir R. Shafto Adair.
2. C. H. Berners, Esq.
3. Rev. McMurdie.
4. F. R. Rodd, Esq.

Class 106.—Eight fruits of any late variety not named above.

Four Prizes, 7s., 6s., 5s., 4s.

1. C. H. Berners, Esq.
2. Rev. McMurdie.
3. Geo. Churcher, Esq.
4. Mrs. Norden.

AFFILIATED SOCIETIES CHALLENGE CUP.

APPLES AND PEARS.

Six Dishes, distinct, Cooking Apples; Six Dishes, distinct, Dessert Apples; Six Dishes, distinct, Dessert Pears, six Fruits to each dish. Each Society competing collects all the specimens shown from amongst their own members only, and not from outside. Eight days' notice must be given of intention to compete.

First, Challenge Cup to be held for twelve months, and Silver Gilt Knightian Medal;
Second, Silver Gilt Banksian Medal.

1. Ipswich and District (J. Mann, Sec., Arboretum Lodge, Ipswich).
- No second.

GENERAL MEETING.

OCTOBER 23, 1917.

Mr. E. A. BOWLES, V.M.H., in the Chair.

Fellows elected (37).—Major B. F. S. Baden-Powell, E. G. Band, W. R. Baxter, Miss M. Bliss, C. J. Bowkett, C. Butler-Stoney, Sir Wm. Cain, F. W. Cockeram, Lady Collingwood, P. C. Crockford, W. J. Dewar, W. Easlea, H. C. Edgell, W. Fletcher, S. Flowers, G. Garnett, Miss P. E. Gibson, Miss B. Hall, G. Inman, James Jennison, C. Kirkby-Fenton, H. A. Lamberton, A. C. Lehan, Miss C. Mackenzie, R. W. Mackmillon, Lady Mallet, Miss S. Moore, W. Oliver, Miss C. E. Partridge, W. Paul, W. C. Phipps, Mrs. H. A. Pringle, W. A. Shoolbred, D. J. Terry, W. A. Wayland, Capt. A. V. Whitehead, A. Wotherspoon.

Affiliated Societies (7).—Egyptian Horticultural Society, Ellesmere Port Co-operative Society, Exmouth Horticultural Society, Glasbury Food Production Society, Irchester Allotment Association, Netherfield and District Gardeners' Association, The Pitmaston Allotment Holders' Association.

A lecture on "Pergolas" was given by Mr. E. White (see p. 291).

GENERAL MEETING.

NOVEMBER 6, 1917.

Mr. G. LODER, F.L.S., in the Chair.

Fellows elected (16).—P. A. Bayman, H. A. M. Borland, A. Currey, C. D. Dick, G. D. Greenough, J. B. Hinshaw, J. H. Lowery, R. W. Macmillan, G. Mitchell, Lieut.-Col. R. B. Orlebar, W. B. Paterson, Miss E. A. Stanford, L. Taylor, A. Thompson, C. G. Traill, G. P. Walford.

Fellows resident abroad (2).—Mrs. F. M. Mason, S. L. Pathack.

Associates (2).—W. Dibben, Miss D. Radcliffe.

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Affiliated Societies (2).—Galbraith Road Allotment Association, Ynysbwl Horticultural Society.

A lecture on "Useful Books for an Amateur Gardener's Library" was given by Mr. E. A. Bowles, V.M.H. (see p. 359).

GENERAL MEETING.

NOVEMBER 20, 1917.

Lord GRENFELL in the Chair.

Fellows elected (18).—H. D. Barton, Dr. F. Bedford, Miss E. Bengough, Rev. T. Bird, W. E. Brockman, Miss H. Dawe, R. S. Farden, Sir W. Hughes-Hunter, A. Jones, M. Lawson, G. H. Mackereth, General Sir A. Paget, A. D. Pilkington, Miss M. K. Southam, Lady A. Stanley, J. R. Stanley, T. G. Toop, J. B. Verel.

Fellows resident abroad (1).—G. L. Hinde.

Associates (1).—Miss L. E. Roberts.

Affiliated Societies (18).—Barry Island Gardeners' Association, Benfieldside and District Amateur Gardeners' Association, Bradford Moor and District Horticultural Association, Cwmaman Horticultural Society, Hampstead Joint War Food Production, Harmondsworth Cottage and Allotment Holders' Association, Hurstmonceux Allotment and Small Gardens Association, Oswaldtwistle Floral and Horticultural Society, Parkhill and District Gardeners' Association, Penkhull and District Gardeners' Association, Rosherville Perry St. and District Allotment Association, St. Osyth Cottage and Allotment Holders' Mutual Improvement Association, St. Paul's Ward Allotment Association, Seaford Ladies' College Allotment Society, Shirebrook Garden Holders' Protection Association, Toll Bar Garden Association, Town Council of Peebles Horticultural Society, Wolseley Club Horticultural Section.

GENERAL MEETING.

DECEMBER 4, 1917.

Sir HARRY VEITCH, V.M.H., in the Chair.

Fellows elected (29).—W. Amos, J. M. Berckmans, Mrs. H. Bourke, C. Britton, W. Brown, Miss E. C. Bumsted, Miss M. E. Charlton, Miss K. L. Cheetham, Miss I. Crofts, J. Dowding, F. N. Ellis, W. H. A. Gaddam, Mrs. F. Holroyd, Miss E. Hooper, Miss E. L. Martin, D. J. Moule, Miss J. Penrose, E. W. Roach, Col. O. P. Serocold, Miss V. S. Slade, Miss E. A. Squire, A. C. Tagg, Mrs. K. G. Tapp, Rev. A. T. Thornley, W. Warburton, H. S. H. Wilding, W. Willis, G. E. Woodman, Mrs. R. E. Younghusband.

Fellows resident abroad (2).—W. C. Davies, T. Padmanabha Pillay.

Affiliated Societies (17).—Acton and District Smallholders' Amateur Gardeners' Association, Acton War Relief Allotment Committee, Atherton and District Horticultural Society, Birmingham City Council Allotment Association, Bury and District Allotment Holders' Association, Crompton District Council Horticultural Society, Eastchurch R.N. Air Station Allotment, Hinckley Sweet Peas and Rose Horticultural Society, Hoylelake and West Kirby Allotment Holders' Association, Levenshulme and District Allotment Holders' Society, Mansfield Woodhouse Garden Holders' Association, May Lane Allotments Association, St. Ippolyts and Gosmore Food Production Society, Tamworth-in-Arden Gardeners' Co-operative Society, Tenby Horticultural Society, Trent Embankment Garden Holders' Association, Tutbury Allotments Association.

SCIENTIFIC COMMITTEE.

JULY 3, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and five members present.

Peloric Delphinium.—Mr. W. C. Worsdell, F.L.S., showed spikes of *Delphinium* var. from Dr. Chapman, of Reigate, of which the terminal flower was regularly peloric and spurred, and the peduncle fasciated.

Festuca × loliacea.—Mr. J. Fraser showed specimens of the hybrid grass *Festuca × loliacea*, derived from *Festuca elatior* and *Lolium perenne*. It is a somewhat variable plant, approaching at times the one, at others the other parent, and is not at all infrequent, apparently especially in water-meadows.

Various Plants.—Mr. Bowles showed, on behalf of Mr. Elwes, the late-flowering Niphium Iris, *I. Taitii*, at its best after all others of this group are past; the Asiatic *Streptopus amplexicaulis*, *Delphinium Brunonianum*, the dwarf form of *Poterium obtusum* called *hakusanense*, a very dark form of *Campanula amabilis*, and a well-fruited shoot of the so-far unnamed *Lonicera* F. 269, collected by Mr. Farrer in Kansu.

SCIENTIFIC COMMITTEE, JULY 17, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and ten members present.

Fasciated Asparagus.—Col. Sandeman, of Hayling Island, sent a very large specimen of the common *Asparagus* showing fasciation, having a stem over 2 inches in breadth.

Infertility in Barley Field.—Dr. J. A. Voelcker showed specimens of Barley from fields on Salisbury Plain very stunted and poor, and another of about normal growth from places in the fields where stooks had stood last season for a month. Doubtless the greater fertility of the place where the stooks had stood was due to the washing out of salts, &c., from the old Barley, and possibly also to protection from washing of the soil beneath them; but the infertility of the remainder of the field, considering the nature of the manurial treatment, must have been at least partially due to some other cause, and possibly to the gout fly, the chrysalids of which were present in some of the specimens.

Enations of Foliage of Picrasma ailanthoides.—Mr. W. C. Worsdell showed foliage of this interesting Himalayan tree belonging to the Simarubaceae, and hardy at Kew, whence the specimens came, having on the upper side of the rachis both at the nodes and along the internodes numerous enations of various forms, some being shaped like a cup or goblet.

Hybrid Calceolarias.—Mr. E. J. Allard showed hybrids between *Calceolaria alba* and other forms, including *cana*, *integrifolia*, and a garden hybrid of *cana*, *alba* being the pollen parent. In every case, foliage, habit and flower colour were of the pollen-parent type, and in every case they were sterile. This is a remarkable case of almost complete paternal inheritance, comparable with the known cases of maternal inheritance, e.g., in *Primulas*. *C. alba* itself is sterile so far as the ovules go.

Various Plants.—Mr. H. J. Elwes showed a number of plants from his garden, including *Astrantia helioborifolia*; a very floriferous *Lonicera* of bushy, late-flowering habit, perhaps *L. grata*; *Pelargonium Endlicherianum*, and others; *Theropogon pallidus*, somewhat resembling a large-flowered pink Lily-of-the-Valley, but lacking scent, native of the Himalaya; *Hymenocallis*; *Aristolochia ornithocéphala*, strongly scented in the daytime, but scentless at night.

Ants and Lilium regale.—Mr. Bowles showed a bud of *Lilium regale* and read the following note: "A group of this growing in a garden at Norwich has been attacked by ants. The owner of the garden has watched the ants at work on the unopened buds, and has seen them carry away particles of green matter that they have apparently extracted from the flower. They confine their attention in the first place to those portions of the flower that are coloured with the chocolate-brown that comes on *regale* in its early stages. The first effect that is apparent is that the chocolate disappears in patches. As the flowers develop the portions attacked begin to decay, and, naturally, spoil the flower."

So far as can be ascertained, no other variety of Lily growing in the neighbourhood has been touched, which would make it appear as though *L. regale* possesses some particular attraction for the pests. It is necessary to find some remedy, as the attacks of the ants are so persistent that a fine group of this beautiful Lily has been ruined within the course of a fortnight." It is probable that a disc of cardboard covered with Tanglefoot fixed round the stem some little distance from the ground would prevent the ants from reaching the flowers.

Change of Colour in a White Currant.—Dr. Walter Dick sent a note calling attention to the complete reversion of a White Currant planted against a wall at Great Massingham, King's Lynn, to a red form. For two years prior to the present the plant bore white Currants, but this season all on the bush are red, and ripe ten days earlier than those on other bushes in the garden.

Spencer-flowered Cupid Sweet Pea.—Mr. G. T. Dickson, Newtownards, sent a Cupid Sweet Pea with waved flowers of the Spencer type, which he had raised along Mendelian lines by crossing (in 1913) a tall Spencer with the ordinary grandiflora type of Cupid Sweet Pea. The new form appeared in the second generation, and has bred true since. Mr. Dickson sent the following note:

The great advantage of the formation of a chart based upon the Mendelian hypothesis by plant breeders before commencing hybridizing is very clearly demonstrated in the following experiments.

In 1912 I considered the possibility of what, to my mind, would be a valuable contribution to floriculture and at the same time provide an experiment of scientific interest.

The experiment, I should further add, was planned on an economic, rather than an academic, basis; the objective I had in view was to put the modern "Spencer form" of the inflorescence of the tall Sweet Pea upon the Cupid or Dwarf type of Sweet Pea, eliminating from the latter variety the horticultural "out of date" Grandiflora inflorescence.

I worked the problem out in theory thus:—

Assuming one can cross successfully the tall Spencer with the Cupid Grandiflora in 1913, the resultant hybrid in 1914 (F₁) generation would be tall, containing the gametes as undernoted.

* Let t = Tall; S = Spencer; C = Cupid; g = Grandiflora.

t and g to be assumed Dominant factors.

S and C to be assumed Recessive factors.

The 1913 cross would be:

Tall Spencer × Cupid Grandiflora;

or, tS × Cg.

resulting in (tSCg); F₁ generation (1914).

The 1914 cross would be tSCg × tSCg.

Thus the gametes in the above hybrid would be as the monoclinous flower plan on p. xcvi shows.

This is a design of my own, and one which I think should simply illustrate the sexual unions as they could take place in an hermaphrodite flower.

The foregoing, as I have already stated, was purely theoretical, but the experiment, covering the years 1913, 1914, 1915, 1916, and proved in 1917, has worked out entirely in agreement with the Mendelian hypothesis.

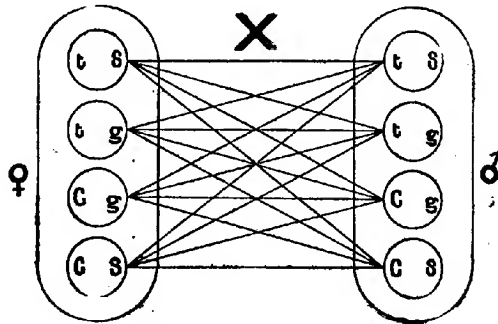
When I commenced my experiment I was doubtful as to whether a sexual affinity existed in the two forms of *Lathyrus* I had chosen to experiment with, and indeed I may add that I had almost given up hope of effecting a cross between the two, for it was only after 130 operations that I established one single cross. With this all-essential success I assumed that the characters for tallness and grandiflora form would be dominant, and that the characters for dwarfness and Spencer form would be recessive, and that when I found the latter in a combined state amongst my cultures in the F₂ generation I had bred the new form, viz. a Cupid Sweet Pea with Spencer flowers, which I had set out to accomplish.

My imaginary chart, which proved a reality, was not based on an unreasonable assumption, for although I was treading, to me, new scientific ground I had no reason to disbelieve that certain factors would be dominant and others recessive, as I had specified.

The experiment suggests (a) that the old Grandiflora Cupid is probably a mutation from the tall form, and (b) that the Spencer form of inflorescence in the Sweet Pea has always been a latent factor.

* I use the capital and small letters to enable a homogeneous and heterogeneous combination to be quickly observed.

From a horticultural point of view I think I can say that the new creation which I have sent to the Committee and which I wish to be named 'Professor James Wilson,' provides a substantial foundation for the establishment of a new race of a beautiful dwarf form of the Queen of Hardy Annuals.



Set out in diagram gives the possible combinations,

| | | ♂ | | | |
|---|-----|---|---|---|---|
| | | t s | t g | C g | C s |
| ♀ | t s | <div><div>t s</div><div>t s</div></div> | <div><div>t g</div><div>t s</div></div> | <div><div>C g</div><div>t s</div></div> | <div><div>C s</div><div>t s</div></div> |
| | t g | <div><div>t s</div><div>t g</div></div> | <div><div>t g</div><div>t g</div></div> | <div><div>C g</div><div>t g</div></div> | <div><div>C s</div><div>t g</div></div> |
| | C g | <div><div>t s</div><div>C g</div></div> | <div><div>t g</div><div>C g</div></div> | <div><div>C g</div><div>C g</div></div> | <div><div>C s</div><div>C g</div></div> |
| | C s | <div><div>t s</div><div>C s</div></div> | <div><div>t g</div><div>C s</div></div> | <div><div>C g</div><div>C s</div></div> | <div><div>C s</div><div>C s</div></div> |
| | C s | <div><div>t s</div><div>C s</div></div> | <div><div>t g</div><div>C s</div></div> | <div><div>C g</div><div>C s</div></div> | <div><div>C s</div><div>C s</div></div> |

F₂ generation
1915

* Seed only from

C s

C s

 culture to be saved and noted in 1916-17.

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SCIENTIFIC COMMITTEE, JULY 31, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and three members present.

Spencer Cupid Sweet Pea.—A Certificate of Appreciation was unanimously recommended to Mr. George T. Dickson, Newtownards, for his work along Mendelian lines in raising the Spencer type of flower combined with the dwarf habit of the Cupid form of Sweet Pea.

Damage by Hail.—Mr. J. Fraser showed a series of plants, including Onions, Potatos and Peas, in which the damage done by hail storms in June was very evident. The Potato had its stem broken, and both Peas and Onions showed white spots as a result of the battering by the hailstones.

Various Plants.—Mr. H. J. Elwes showed a number of plants from his garden, including *Poterium tenuifolium album*, which there attains to 6 feet in height; *Prunella grandiflora* and *P. Webbiana*; *Dendrobium aurantiacum*, the pseudo-bulbs of which are collected and used in Japanese medicine; *Lycoris squamigera* and *Crinum yemense*, which thrive at Colesborne against a wall; *Crinum Rattrayi*; *Hymenocallis* sp. with an exceedingly sweet scent; *Alstroemeria peregrina alba*; and a species of *Hunnemannia*, a tender plant which when treated as a half-hardy annual does well outdoors.

Nuttallia cerasiformis Fruiting.—Mr. Bowles showed fruits of *Nuttallia* from his garden. Most trees and shrubs of spring-flowering habit appear to be fruiting freely this year.

Curious Sport in Delphinium.—Mr. Berkley, of Redgate Hall, Wolsingham, Co. Durham, sent leaves from a Hybrid Delphinium in his garden, one branch of which, while bearing normal flowers, differed from the others in having entire leaves similar in form to those of *Clematis integrifolia*.

Blackthorn Growing on Apple Bark.—Sir Harry Veitch sent a piece of Apple bark from which a Blackthorn, *Prunus spinosa*, was growing much in the same way as does Mistletoe. Mr. Elwes mentioned the case of a Hawthorn which was growing from the branch of a Scots Fir, apparently, as in the Blackthorn shown, rooting into the branch itself.

Sport in Diervilla.—Mr. John Grimes sent from his garden at Cardiff branches of *Diervilla rosea* in which, instead of the normal opposite decussate arrangement of leaves in the upper part of the shoots, the leaves were in whorls of three. This had first occurred in 1915.

SCIENTIFIC COMMITTEE, AUGUST 14, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and six members present.

The late Mr. C. T. Druery, V.M.H.—Mr. Bowles referred to the loss the Committee had sustained in the death of Mr. C. T. Druery, who had for many years been a member of the Committee. It was unanimously agreed that a vote of condolence be sent to his relatives, with an expression of the Committee's appreciation of the work Mr. Druery had done in furthering a knowledge of our native Ferns and in the discovery of apospory.

Various Plants.—Mr. H. J. Elwes, F.R.S., exhibited a number of plants from his garden, including *Allium macranthum*, a species which he had collected thirty-six years before in Sikkim; *A. Wallichianum*, an almost stoloniferous species with a singularly compressed and winged stem, also from Sikkim; a woolly species of *Delphinium* from Kashmir; *Zephyranthes candida major*; a species of *Habranthus* from the Argentine with a jointed bulb; *Gladiolus Papilio*, and others.

Potato Black-leg.—Mr. J. W. Odell showed specimens of Potatos affected by the bacterial disease called black-leg, which seems to be rather more prevalent than usual this year. The most marked symptom is the presence of dark patches in the vascular bundles when they are cut across near the base of the stem owing to the vessels being filled with bacteria. Such plants should be lifted at once and their produce should not be used for seed next season.

Ants and Lily Flowers.—Mr. Bowles showed buds of *Lilium sulphureum* from Mr. Fletcher, of Aldwick Manor, Bognor, which had been damaged by ants in the same way as had those which came from Norwich recently. A further communication concerning the latter from Dr. C. A. P. Osburne, from whose garden they came, pointed out that the buds attacked in many cases failed to

open properly, but split across one or more of the petals, while in others the edges of the petals were damaged. It would be of interest to learn whether other species besides *regale* and *sulphureum* are attacked by ants in this manner.

Raspberry Canker.—Some canes of Raspberry attacked by a species of *Coniothyrium* allied to or identical with the one which causes canker in Roses came from Mr. Beresford, of Presbury, Cheshire. The bark was split and a considerable amount of corrugated growth had developed on the edges of the wounds. This growth was soft in character, and had dried up to some extent in the specimens sent. A similar complaint had occurred some years ago on Chinese Brambles at Wisley, but had not spread, so that cutting out the diseased canes will probably prove an effective check upon the disease.

SCIENTIFIC COMMITTEE, AUGUST 28, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and five members present.

The late Mr. Charles Drury.—A letter was received from Mr. T. Murray acknowledging the vote of condolence to the relatives of the late Mr. Charles Drury.

Plumose form of Plantago major.—Mr. Bowles exhibited the plumose form of *Plantago major* similar to that figured in Gerard's Herbal.

Hybrid Campanulas.—Mr. T. B. Grove sent the following notes on the crossing of *Campanulas*, illustrating them with an interesting series of nature-printed figures of the crosses obtained.

Comparison of F₁ Seedlings and the effect of the ♂.

"*Camp. carpatica* 'White Star' ♀ × *Tommasiniana* ♂ produced nineteen seedlings Z1 to Z19, all similar in growth and foliage, viz. intermediate between the two parents, and all had uniform blue flowers, only varying slightly in size and in vigour, but all partook more in branched habit, and foliage of the ♂ than otherwise. I cannot show prints of this series as I only have about half a dozen varieties left of the nineteen.

"During 1915 I crossed:

"Firstly, Z1 ('Norman Grove') ♀ × *Waldsteiniana* ♂ and obtained six seedlings.

"Secondly, Z1 ♀ × *Tommasiniana* ♂ and obtained thirteen seedlings. Note the ♂ the same as in Z1.

"Thirdly, Z1S. 47 ('Wyndley Purple') ♀ × *Waldsteiniana* ♂ and obtained two seedlings.

"The first series of six all showed the effect of the ♂ in the small foliage and erect blooms and habit of flower.

"It will be seen from the prints that all are similar to the ♂ in foliage, with a decided likeness to the same variety in habit of growth, and in every instance have erect flowers like to *Waldsteiniana*.

"The second produced thirteen seedlings of which two have not flowered, but the eleven which have, have all produced blue flowers, eight medium, two darker than type, and one very pale. All are more or less pendant in flower, and most of them show a tendency to the bunched habit of the ♂—in fact, the whole series show a greater similarity in their growth and general appearance to the pollen parent, although in this case it has not been attended with the lanceolate form of foliage of *Tommasiniana*.

"The third cross produced two seedlings, both of which have rich purple-coloured flowers, are both erect in habit of flowering and dwarf in growth like the ♂, and although the foliage is not so small as that variety, the leaves seem to set themselves erect and stiff, more like the ♂ than the ♀. The No. 2 seedling is the more compact, and will make a grand front line variety.

"During 1916 I crossed a large pure white F₁ seedling of Z8 × 'White Star' No. 2 (Z8 is brother to 'Norman Grove,' and which has proved to be a 'White Riverslea') with pollen of *Waldsteiniana* on one bloom and with pollen of *Tommasiniana* on another bloom of the same spike of flower, and from these two seed pods I have two series of plants which show the effect of the ♂ in a very marked degree.

"The *Tommasiniana* seedlings again are in the majority, as I have about sixty, of which half have flowered, and all of which show a great similarity to the first seedlings from 'White Star' × *Tommasiniana*, being uniform in colour and pendant in bloom.

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"The *Waldsteiniana* seedlings number nine, and all show the ♂ influence in the erect flowers, the erect growth, and the small foliage and dwarf habit from 6 to 8 inches, but which vary a little in range of colour (all blue) from a lovely sky-blue, rather deeper than the ♂.

"I have made prints of all that have flowered except the sixty *Tommasiniana* seedlings which are so uniform in shape and colour, and have also included in the book prints of Z8, W. S. 2, "*Waldsteiniana*, *Tommasiniana*, 'Norman Grove,' and 'Wyndley Purple' for comparison.

"I regret I cannot send prints of result of Z8 ♀ and 'White Star' ♂, as I have only saved the No. 2 seedling, but originally there were nine seedlings, eight of which were white, like the ♂, and flat saucer-shaped from 1 to 1½ inch across. The other one was a blue colour, and not so saucer-shaped, being a deeper cup, but they all had 'White Star' foliage and habit and ranged from 1 foot to 1½ foot in height.

"These are from written records of the series as I bloomed them, but they show the same influence of the ♂."

The Committee passed a vote of thanks to Mr. Grove.

Pear attacked by Capsid Bugs.—Mr. W. H. North sent a pear from his garden at Southvale Road, Blackheath, attacked by Capsid bugs and showing scabby spots similar to those produced by these pests on Apples.

Fasciated Dahlia.—Mr. Fife sent the stem of a Dahlia in which no branches had been produced in the lower part of the stem, and which showed fasciation above. The buds in the lower part of the stem had apparently not developed, and the phyllotaxis was abnormal.

SCIENTIFIC COMMITTEE, SEPTEMBER 11, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and five members present.

Trachycarpus excelsus Fruiting.—Mr. Cory sent from his garden at Duffryn a fruiting shoot of this hardy Palm.

Rust on Black Currant.—Mrs. Shaw sent from Kentchurch Court, Hereford, foliage of Red and Black Currants bearing the teleutospores of the rust fungus *Cronartium ribicola*. This fungus is very prevalent this year and does great damage to young plants of the five-leaved Pines, and especially to *Pinus Strobus*.

SCIENTIFIC COMMITTEE, SEPTEMBER 25, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and one member present.

Twin Plum.—Mr. A. McL. May, of Coleraine, Ireland, sent a twin plum in which each part contained a stone. Such twin plums generally arise from the presence of two carpels in the one flower, in place of the normal single one.

A large number of plants attacked by common diseases were sent.

SCIENTIFIC COMMITTEE, OCTOBER 23, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and seven members present.

Fruit of Trachycarpus excelsus.—Mr. J. Fraser, F.L.S., showed the immature fruits of this Palm from a tree in the open at Holland House, and remarked upon the distribution of male, female, and hermaphrodite flowers, the fruits having developed from the last form of flower. Mr. Bowles said he usually found the last flowers to open were female, as they are in *Begonia* and *Aegle sepiaria*.

Various Plants.—Mr. Bowles showed the fruit of *Lonicera Hildebrandii* from a cold greenhouse at Earlham—a very large fruit for a member of this genus, measuring over an inch in diameter; *Rhodostachys argentea*, with stalked heads of flowers; *Ahebia lobata* fruit, from Mr. Howard Baker's garden near Bristol; fruit of *Actinidia chinensis*, from Mr. P. D. Williams' garden at Lanarth. Cornwall; fruits of the deep-flowered form of *Cydonia Maulei*, to draw attention to their strong and pleasant perfume; fruits of *Arum italicum*, with the foliage appearing this year unusually early; *Arum hygrophilum*, from the Holy Land; and that of a robust form of *Arum Dracunculoides*, all from Myddelton House Gardens, whence also came ripe fruits of the double red Peach, which has from 2 to 4 ovaries, and which bears twin fruits, of the purple-leaved Peach, of the variegated form of *Cornus Mas*, and of the yellow-fruited Yew.

SCIENTIFIC COMMITTEE, NOVEMBER 6, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and eight members present.

Twin Vegetable Marrows.—Mr. J. Fraser, F.L.S., showed a Vegetable Marrow with two adnate fruits, and remarked that a considerable number of similar instances had come to his notice during the present year, the twin fruits being sometimes separate.

Many-seeded Apples.—He also showed seeds taken from varieties 'Duchess Favourite,' 'Winter Quarrenden,' and 'King of the Pippins,' showing seeds in excess of the normal number, 10. Such excess number, up to 20, appears to be fairly constant in some varieties, e.g., 'American Mother,' where four ovules in each carpel appear to be normal.

Proliferation in Rhododendron Flowers.—Mr. W. C. Worsdell showed flowers of *Rhododendron* bearing a second flower, a prolongation of the axis through the ovary. He drew attention to the fact that the axis was normally prolonged through the ovary in this plant.

Variation in Leaves of Morus, &c.—He also commented upon the occurrence of both simple and lobed leaves in plants of the genera *Morus* and *Broussonetia*. He suggested that possibly the lobed leaf was a primitive, the entire a less primitive character in these genera, for strong shoots usually bear lobed leaves. Specimens of *Morus acidosa* shown were almost all lobed, while in many species of *Morus* and *Broussonetia* simple leaves are the rule.

Buds on Roots of Solanum Dulcamara.—Dr. Rendle showed a plant of *Solanum Dulcamara* with a stout root bearing numerous buds all along its length.

SCIENTIFIC COMMITTEE, NOVEMBER 20, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and four members present.

Fruiting of Wistaria.—Mr. Bowles showed fruits of *Wistaria multijuga*, which frequently fruits in his garden, though less profusely this year than in the past season; and of *W. sinensis* now fruiting for the first time in his garden.

Wheat-ear Carnation.—He also showed from Mr. R. Page a specimen of the well-known Wheat-ear Carnation where a multiplication of the bracts takes the place of the flower.

Insect Attack on Leaves of Iris foetidissima.—He also brought from his garden leaves of *Iris foetidissima* with the larvæ and pupæ of a mining *Dipteron* sp.? Several of the larvae feed together in the leaf and pupate in colonies.

Loganberries attacked by Gall on Stem.—Mr. J. Fraser, F.L.S., showed stems of Loganberries attacked by a gall on the stem, similar to those on the stems of Brambles and Raspberries recently shown, and probably due to the attack of the fungus *Coniothyrium* sp.

SCIENTIFIC COMMITTEE, DECEMBER 4, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and six members present.

Calystegia Sepium rosea.—Mr. J. Fraser, F.L.S., showed specimens of the pink form of *C. Sepium* which he had collected in apparently wild localities in Surrey. Possibly the seed was carried by some means from a garden, for the variety is often seen in gardens.

Convolvulus arvensis hastatus.—He also showed a curious form of the common Bindweed with very narrow leaves which he had found near Molesey, and it was found to agree with the description of the variety *hastatus*.

House Refuse.—Mr. J. Hudson showed a sample of finely powdered house refuse which was being offered as a manure. Since such samples contain large quantities of coal ashes it is unlikely that their value will be great, though if it is to be had for a nominal sum, and at small cost for carting, the material may be worth using. It is bound to be somewhat variable in composition.

Supposed Influence of Light on Fasciation and Flower Production.—Col. H. E. Rawson showed further illustrations of fasciation appearing in plants of *Tropaeolum tuberosum* which were screened in the open garden. Successive

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cords had bifurcated till the stems, 22 in number, had become fasciated flat ribbons 10 to 21 mm. wide, closely covered with leaves and without any flowers. In the same position for the two previous years and unscreened the plant showed no signs of fasciation and bore flowers freely. Further examples were shown of increased flowering arising on selectively screened plants, all leaves being suppressed and the flowers appearing in clusters. Spectroscopic examination had shown that red light had been in excess during the increased flowering and blue light during fasciation.

Seedling Pyrus with Adventitious Roots.—Mr. Bowles showed a seedling of *Pyrus Niedzwetzkyana* with adventitious roots in considerable numbers appearing at the nodes as in the old Burr-knot Apple, and as happens in seedling Crabs at times.

Chimonanthus fragrans.—Mr. Bowles also showed flowers of the variety *grandiflorus* of *Chimonanthus fragrans* appearing thus early in the winter.

Stuartia Pseudo-camellia Fruiting.—Rev. W. Wilks sent ripe fruits of *Stuartia Pseudo-camellia* from his garden, where, for the first time, fruits had been produced abundantly.

FRUIT AND VEGETABLE COMMITTEE.

JULY 3, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and fourteen members present.

No awards were recommended on this occasion.

Exhibits.

Mr. V. Banks, London : bottled fruits and vegetables.

Mr. H. Close, Orpington : Red Currant 'Little Croft Beauty.'

The following report on Marrow 'Rotherside Orange,' exhibited at the previous meeting, was submitted by the Rev. W. Wilks : " I consider it an excellent variety. If when grown out of doors it is as good, it will, I think, take a high place. It is of firmer, more 'meaty,' consistency than any marrow I ever tasted—less watery, in fact, which is the general fault of marrows. Its flavour too is excellent."

FRUIT AND VEGETABLE COMMITTEE, JULY 6, 1917.

SUB-COMMITTEE AT WISLEY.

Mr. W. BATES in the Chair, and three members present.

The Sub-Committee inspected the trials of Broad Beans, Shallots, and of mid-season Peas which received awards last year, and made recommendations for awards to be approved by the full Committee.

FRUIT AND VEGETABLE COMMITTEE, JULY 17, 1917.

Mr. A. H. PEARSON, V.M.H., in the Chair, and fourteen members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Messrs. Barr, Taplow, for vegetables.

Silver Banksian Medal.

To the High Commissioner of New Zealand, London, for N.Z. Apples.

Other Exhibits.

Mr. H. Close, Orpington : Currant 'Littlecroft Beauty.'

Mr. V. Banks, London : bottled fruit and vegetables.

The following awards recommended by the Sub-Committee to Broad Beans and a variety of mid-season Pea on trial at Wisley were confirmed by the full Committee.

AWARDS TO BROAD BEANS.

Award of Merit.

No. 5, 'Broad Windsor,' from Messrs. Dobbie.

No. 26, 'Exhibition Longpod,' from Messrs. Dobbie.

No. 43, 'Green Giant,' sent by Messrs. Sutton.

Highly Commended.

No. 22, 'Erdington Gem,' sent by Messrs. Holder & Tilt, Birmingham.

No. 1, 'Giant Windsor,' sent by Messrs. Sutton.

No. 41, 'Green Leviathan,' sent by Messrs. Carter.

No. 10, 'Green Windsor,' sent by Messrs. Sutton.

No. 2, 'Mammoth Windsor,' sent by Messrs. Carter.

No. 25, 'Prizetaker Exhibition Longpod,' sent by Messrs. Bunyard.

No. 33, 'Prolific Longpod,' sent by Messrs. Sutton.

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Commended.

- No. 39, 'Invicta,' sent by Messrs. Nutting.
No. 8, 'Market Garden Windsor,' sent by Messrs. Carter.

AWARD TO MID-SEASON PEA.

First-class Certificate.

- To Pea 'Clipper,' sent by Messrs. Sydenham (A.M. 1916).

FRUIT AND VEGETABLE COMMITTEE, JULY 31, 1917.

Mr. OWEN THOMAS, V.M.H., in the Chair, and fifteen members present.

Awards Recommended:—

Silver Banksian Medal.

- To Messrs. Spooner, Hounslow, for Apples.

Cultural Commendation.

- To Mr. Anderson, Wellington, New Zealand, for Apple 'Sturmer Pippin.'

Other Exhibits.

- Mr. V. Banks, London : bottled fruit and vegetables.
Messrs. Dobbie, Edinburgh : Broad Bean 'Dobbie's Broad Windsor.'

The following awards recommended by the Sub-Committee to Onions (autumn sown), and Beet on trial at Wisley were confirmed.

ONIONS, AUTUMN SOWN.

Award of Merit.

- No. 40, 'Autumn Triumph,' sent by Mr. Beckett.
No. 70, 'Froxfield,' sent by Messrs. Barr.
No. 83, 'Mammoth Red Tripoli,' sent by Messrs. Webb.
No. 11, 'White Leviathan,' sent by Messrs. Sutton.
No. 23, 'Yellow Rocca,' sent by Mr. J. Harrison.

Highly Commended.

- No. 48, 'Ailsa Craig,' sent by Mr. J. Wilson.
No. 5, 'Covent Garden,' sent by Messrs. Barr.
Nos. 30, 31, 'Cranston's Excelsior,' sent by Messrs. Barr and Wilson.
No. 59, 'Giant Globe Rocca,' sent by Messrs. Barr.
Nos. 20, 21, 22, 'Giant Lemon Rocca,' sent by Messrs. Sutton, Nutting, and Webb.
No. 56, 'Giant Rocca Tripoli,' sent by Messrs. Sydenham.
No. 79, 'Red Italian Tripoli,' sent by Messrs. Nutting.
Nos. 32, 33, 'Trebons,' sent by Messrs. Barr and Nutting.
No. 15, 'White Italian Tripoli,' sent by Messrs. R. Veitch.
No. 8, 'White Spanish Selected,' sent by Messrs. Barr.

Commended.

- Nos. 47, 49, 53, 'Ailsa Craig,' sent by Messrs. Harrison, R. Veitch, and Sutton.
No. 82, 'Bassano Tripoli,' sent by Messrs. R. Veitch.
No. 39, 'Giant Zittau,' sent by Messrs. Harrison.
No. 25, 'The Sutton Globe,' sent by Messrs. Sutton.
No. 12, 'White Emperor,' sent by Messrs. Carter.
No. 13, 'White Italian,' sent by Messrs. Harrison.

GLOBE BEET, SPRING SOWN.

Award of Merit.

- No. 5, 'Dewing's Turnip-shaped,' sent by Messrs. Barr.
No. 2, 'Globe,' sent by Messrs. Sutton.

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Highly Commended.

- No. 19, 'Crosby's Egyptian,' sent by Messrs. Barr.
No. 9, 'Selected Globe,' sent by Messrs. Dobbie.

Commended.

- No. 11, 'Crimson Globe,' sent by Messrs. Notcutt.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 14, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and thirteen members present.

Award Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Dobbie, Edinburgh, for Potatos.

Other Exhibits.

- Mrs. Berghem, Hampstead : Peach 'Valparaiso.'
Messrs. Cannell, Eynsford : Tomato 'Lawson's Favourite' and seedling Apples.
Mr. H. Close, Orpington : Plum 'Crofton Glory.'
Mrs. B. Newell, Waterford : Tomatos.
C. Urban, Esq., Teddington : variegated Leek.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 17, 1917.

SUB-COMMITTEE AT WISLEY.

Mr. J. CHEAL, V.M.H., in the Chair, and three members present.

The Sub-Committee inspected the trial of Late Peas and made recommendations for awards for the approval of the full Committee.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 28, 1917.

Mr. J. CHEAL, V.M.H., in the Chair, and eleven members present.

Awards Recommended :—

Gold Medal.

To Mr. V. Banks, London, for bottled fruits and vegetables.

Silver Knightian Medal.

To Messrs. Spooner, Hounslow, for Apples.

Award of Merit.

To Plum 'Utility' (votes unanimous), from Messrs. Laxton, Bedford. A first-rate, oval, dessert Plum of medium size with a Gage flavour. It is the result of a cross between 'Jefferson Gage' and 'Peach Plum.'

Cultural Commendation.

To Sir Albert Rollit, Chertsey, for Figs grown out of doors at Chertsey.

The following awards recommended by the Sub-Committee to Late Peas on trial at Wisley were confirmed.

Award of Merit.

- No. 24, 'Latest of All,' sent by Messrs. Barr.
Nos. 57, 58, 'Longstander,' sent by Messrs. Sutton and Messrs. Barr.
No. 42, 'Rearguard,' sent by Messrs. Hurst.

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Highly Commended.

- No. 30, 'Autocrat,' sent by Messrs. Simpson.
No. 23, 'Perpetual Bearer,' sent by Messrs. Barr.
No. 2, 'Reliable,' sent by Messrs. Harrison.
Nos. 12, 14, 'The Gladstone,' sent by Messrs. Simpson and Messrs. Barr.

Commended.

- No. 25, 'Anticipation,' sent by Messrs. Carter.
No. 20, 'Late Queen,' sent by Messrs. Nutting.
No. 45, 'Michaelmas,' sent by Messrs. Barr.
No. 55, 'Ne Plus Ultra Selected,' sent by Messrs. Barr.

Other Exhibits.

- Messrs. Bunyard, Maidstone : Apple 'Maidstone Favourite.'
Messrs. Chapman, Rye : Marrow 'Rotherside Orange.'
Capt. Stokes, Milford Haven : Onion 'Improved Reading.'

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 11, 1917.

Mr. A. H. PEARSON, J.P., V.M.H., in the Chair, and eleven members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

- To Mr. J. C. Allgrove, Slough, for fruit-trees in pots.
To C. G. A. Nix, Esq. (gr. Mr. Neal), Crawley, for a collection of fruit.

Silver Knightian Medal.

- To Mr. H. Close, Orpington, for a collection of fruit.

Other Exhibits.

- Messrs. Bunyard, Maidstone : Grapes.
Messrs. Cannell, Eynsford : Apple 'James Lawson' and Tomato 'Lawson's Favourite.'
F. H. Chapman, Esq., Rye : Marrow 'Rotherside Orange.'

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 25, 1917.

Mr. A. H. PEARSON, V.M.H., in the Chair, and thirteen members present.

Awards Recommended :—

Gold Medal.

- To Messrs. Dobbie, Edinburgh, for Potatoes.
To University College, Reading, for vegetables.

Silver-gilt Knightian Medal.

- To The Marquis of Ripon (gr. Mr. T. Smith), Kingston Hill, for Apples and Pears.

Silver-gilt Banksian Medal.

- To The Alliance Vegetable Co., London, for dried vegetables.

Silver Knightian Medal.

- To Messrs. Sutton, Reading, for Marrows, Pumpkins, &c.

Silver Banksian Medal.

- To Mr. J. C. Allgrove, Slough, for Plums.
To Mr. H. Close, Orpington, for fruit.
To Messrs. Dickson & Robinson, Manchester, for Onion 'Premier.'

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Other Exhibits.

Messrs. Cannell, Eynsford : Apples.
Mr. W. Pope, Newbury : Apple 'Welford Beauty.'
Messrs. Whitelegg, Chislehurst : Apple 'Arthur Theed.'

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 28, 1917.

SUB-COMMITTEE AT WISLEY.

Mr. OWEN THOMAS, V.M.H., in the Chair, and three members present.

The Sub-Committee inspected the trials of Spring Sown Beet, Spring Sown Onions, and Wart Resistant Potatoes at Wisley, and made recommendations for awards for the approval of the full Committee.

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 9, 1917.

Mr. A. H. PEARSON, V.M.H., in the Chair, and twenty-four members present.

Award Recommended :—

Award of Merit.

To Plum 'Victor Christian' (votes unanimous), from Mr. Vizard, Church-down, Gloucestershire.

Fruit large, growing in clusters, oval in shape, black in colour, and covered with a dense bluish bloom, flesh yellowish and full of juice. A valuable late variety for cooking purposes. The tree is a heavy bearer, a vigorous grower, and of sturdy habit.

The following awards recommended to Spring Sown Onions by the Sub-Committee after trial at Wisley were confirmed.

Highly Commended.

No. 35, 'Al,' sent by Messrs. Sutton.
No. 20, 'Ailsa Craig,' sent by Messrs. Dobbie.
No. 12, 'Bedfordshire Champion,' sent by Messrs. Sutton.
No. 32, 'Champion,' sent by Messrs. E. W. King.

Commended.

No. 25, 26, 'Up-to-Date,' sent by Messrs. Nutting, London, Mr. Gray, Sandy, Beds.

Other Exhibits.

Mrs. Backhouse, Sutton St. Nicholas : seedling Apple.
Mrs. Berkeley, of Spetchley, Worcester : *Vitis betulifolia*.
Messrs. Cannell, Eynsford : seedling Apples.
Mr. G. Carpenter, Byfleet : seedling Apples.
Mr. H. Close, Orpington : seedling Plum.
Messrs. Daniels, Norwich : Apple 'Norvic.'
Sir C. S. Henry, Bt., Henley-on-Thames : seedling Apple.
J. Leivers, Esq., Middlebrook : seedling Apple.
Mr. W. Peters, Leatherhead : Apples 'William Peters' and 'Harry Pring.'
C. H. E. Stacey, Esq., Chesham : seedling Apples.
Mr. J. Stevens, Kensal Rise : seedling Pear.
Messrs. Tucker, Faringdon : Apple 'Tucker's Seedling.'
Messrs. R. Veitch, Exeter : fruiting shrubs.
Messrs. J. Waterer, Sons, & Crisp, Twyford : seedling Apple.
Messrs. Whitelegg, Chislehurst : seedling Apples.

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FRUIT AND VEGETABLE COMMITTEE, OCTOBER 12, 1917.

SUB-COMMITTEE AT WISLEY.

Mr. W. POUPART in the Chair, and two members present.

The Sub-Committee inspected the trial of Wart Resistant Potatoes (including cooked samples of each variety) at Wisley and made recommendation for awards for the consideration of the full Committee.

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 23, 1917.

Mr. W. POUPART, in the Chair, and eleven members present.

Awards Recommended:—

Gold Medal.

To Messrs. Barr, Taplow, for vegetables.
To Messrs. Bunyard, Maidstone, for fruit.

Silver-gilt Hogg Medal.

To C. A. Cain, Esq., J.P. (gr. Mr. T. Pateman), Welwyn, for fruit.

Silver-gilt Knightian Medal.

To E. E. Palmer, Esq. (gr. Mr. H. E. Wallis), Sherfield-on-Loddon, for vegetables.

Silver Knightian Medal.

To Lady Elizabeth Dawson, Maidenhead, for bottled fruits and vegetables.
To Messrs. Sutton, Reading, for autumn sown vegetables.
To the Council School (headmaster, Mr. A. Stapleton), Purfleet, for fruit and vegetables.

First-class Certificate.

To Apple 'Ellison's Orange' (votes unanimous), from Mr. H. Markham, Barnet. This variety, which received an Award of Merit in 1911, is said to be a cross between 'Cox's Orange Pippin' and 'Calville Blanche.' It is of medium size, yellowish in colour, of excellent flavour, and ripens in October. It is reported to be a good cropper.

Award of Merit.

To Apple 'William Peters' (votes unanimous), from Mr. W. Peters, Leatherhead. Fruit medium size, even and regular in outline; eye open, set in a deep, even-shaped basin; stalk 1 inch long, thin, set in an even, medium-sized cavity; skin, when ripe, greenish-yellow, with broken stripes of bright red where exposed to the sun, a few specks of russet; flesh greenish-yellow, very tender, juicy, sweet, melting, with a delicate flavour. This variety is a first-rate dessert apple, ripe in October, and was raised by Mr. W. Peters, of Givons Gardens, Leatherhead (fig. 60).

The following awards to Beet (spring-sown) and Wart Resistant Potatoes recommended by the Sub-Committee after trial at Wisley were confirmed.

BEET, SPRING SOWN.

First-class Certificate.

No. 41, 'Green Top,' Sutton's strain, sent by Messrs. Sutton.

Award of Merit.

No. 57, 'Brydon's Exhibition,' sent by Messrs. Barr.
No. 45, 'Cheltenham Green Top,' sent by Messrs. Sydenham.
Nos. 36, 37, 'Dewar's Northumberland Red,' sent by Messrs. Barr & Nutting.
No. 38, which was sent in as 'Covent Garden Compact Top' by Messrs. Barr, but was considered identical with Nos. 36 and 37.
No. 49, 'Sutton's Perfection,' sent by Messrs. Sutton.
No. 53, 'Selected Red,' sent by Messrs. Nutting.

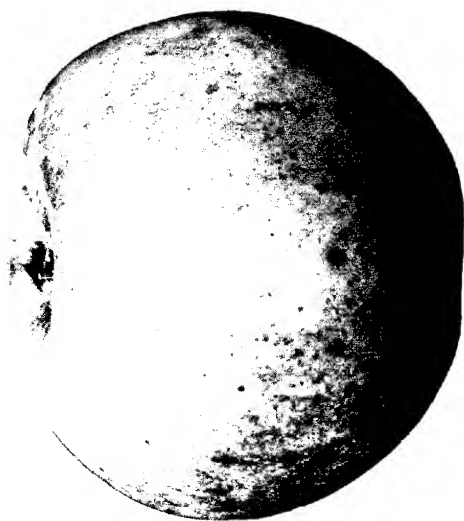


FIG. 60.—APPLE, WILLIAM PETERS,
(p. cviii.)

Uta hux p. cviii.

Highly Commended.

- Nos. 67, 68, 69, 'Deep Blood Red Non-bleeding,' sent by Messrs. McLennan, Veitch, Bell : raised and introduced by Messrs. Bell.
 No. 65, 'Sutton's Black,' sent by Messrs. Sutton.
 No. 66, 'Dobbie's Purple,' sent by Messrs. Dobbie.
 The Committee consider 65 and 66 to be identical.
 No. 48, 'Market Favourite,' sent by Messrs. Sutton.
 No. 29, 'Veitch's Intermediate,' sent by Messrs. Sutton.
 No. 73, 'Yates' Nonpareil Red,' sent by Messrs. Barr, raised by Mr. Yates.

Commended.

- No. 31, 'Carter's Perfection,' sent by Messrs. Carter.
 No. 52, 'Pragnell's Exhibition,' sent by Messrs. Barr.
 No. 23, 'Queen of the Blacks,' sent by Messrs. Barr.

POTATOS.

Awards to Potatos resistant to wart disease grown at Wisley to compare cropping and cooking qualities.

The names in brackets following the name of the variety are of those who presented the seed or from whom it was purchased. The seed was in each case grown in Scotland or Ireland.

Award of Merit.

- Nos. 30, 31, 'Golden Wonder' (Dobbie, Sutton).
 Nos. 6, 7, 8, 'Great Scot' (Dobbie, Sutton, Veitch), with which the Committee considered No. 9, 'Sir Douglas Haig' (Sands), and No. 10, 'Southampton Wonder' (Toogood), to be identical.
 No. 20, 'King Albert' (Sands).
 No. 5, 'King George' (Sutton).
 Nos. 27, 28, 'Langworthy' (Dobbie, Sutton), with which the Committee considered No. 29, 'What's Wanted' (Sutton), to be identical.

Highly Commended.

- No. 26, 'Burnhouse Beauty' (Dobbie).
 No. 4, 'Conquest' (Sutton).
 No. 45, 'Dominion' (Dobbie).
 Nos. 13, 14, 'Favourite' (Dobbie, Sutton).
 Nos. 32, 33, 'Rob Roy' (McAlister, Veitch).
 No. 44, 'St. Malo Kidney' (Fidler).
 No. 22, 'The Crofter' (Dobbie).
 No. 24, 'Twentieth Century' (Sutton).
 Nos. 42, 43, 'White City' (Dobbie, Sutton).
 No. 49, 'Western Hero' (Veitch). This variety has not yet been grown in the trials carried out under the Board of Agriculture for wart-resistance.

Other Exhibits.

- Mr. A. R. Allan, Uxbridge : seedling Grapes.
 Mr. A. Bayley, Slough : Apples.
 Mr. T. Coomber, V.M.H., Monmouth : seedling Apple.
 Messrs. Godden, Hythe : Apple 'Autumn Peach'.
 Mr. W. Humphreys, Huntingdon : seedling Apple.
 Messrs. Laxton, Bedford : seedling Apples.
 Mr. W. Mason, Royston : seedling Apple.
 Mr. W. R. North-Row, London : Quinces.
 R.H.S. Gardens, Wisley : Beets and Wart Resistant Potatos.
 Dr. Rosenheim, Hendon : Grapes.
 Mr. W. H. Sale, J.P., Atherstone : seedling Apple.
 Mr. R. G. Searle, Chipping Ongar : Apples.
 Mr. J. C. Sheddick, Dereham : Apple 'Paragon'.
 The Alliance Vegetable Co., London : Potato 'Ever-Ready.'

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FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 6, 1917.

Mr. W. POUPART in the Chair, and twelve members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Messrs. Cannell, Eynsford, for a collection of fruit.

Silver Knightian Medal.

To The Alliance Vegetable Company, London, for Potato 'Ever Ready.'

Silver Banksian Medal.

To O. Rosenheim, Esq., Golders Green, for 'Black Hamburg' Grapes grown out of doors.

Cultural Commendation.

To O. Rosenheim, Esq., Golders Green, for 'Black Hamburg' Grapes grown out of doors.

Other Exhibits.

Mr. A. Bayley, Slough : Apple 'Orange Pippin.'

Messrs. Chapman, Rye : Apples.

Messrs. Cooling, Bath : seedling Apple.

Mr. W. H. Divers, V.M.H., Hook : Apple 'Col. Yate.'

Mr. W. Pope, Newbury : Apple 'Welford Beauty.'

FRUIT AND VEGETABLE COMMITTEE, NOVEMBER 20, 1917.

Mr. W. POUPART in the Chair, and eleven members present.

No awards were recommended on this occasion.

Exhibits.

Mr. C. Elliott, Stevenage : seedling Apple.

Mr. W. H. Newton, Potters Bar : Lettuce 'Winter Beauty.'

Mr. S. Shorter, Seven Kings : Pear 'Shorter's Prolific.'

Mr. J. Vernon, Northwich : Apples.

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 4, 1917.

Mr. W. POUPART in the Chair, and twelve members present.

Awards Recommended :—

Silver Knightian Medal.

To Col. W. N. Davis (gr. Mr. Bullock), Slough, for Apples and Pears.

Silver Banksian Medal.

To Sir Daniel Gooch (gr. Mr. Heath), Chelmsford, for Apples.

To Mrs. Miller, Marlow, for confections.

Other Exhibits.

Mr. V. Banks, London : the Home Canner.

Messrs. H. Chapman, Rye : Apple 'Saltcote Pippin.'

Mr. T. Coomber, V.M.H., Monmouth : Apple 'Thomas Coomber.'

Mr. J. Keates, Gt. Marlow : seedling Apple.

Mr. J. Leeder, Postwick : Apple 'Leeder's Perfection' and Apple 'Postwick Rose.'

FLORAL COMMITTEE.

JULY 3, 1917.

Mr. H. B. MAX, V.M.H., in the Chair, and twenty-six members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Baker, Wolverhampton, for hardy plants.
To Messrs. Blackmore & Langdon, Bath, for Delphiniums and Begonias.
To Mr. W. H. Holloway, Shrewsbury, for Sweet Peas.
To Messrs. Piper, Langley, for Sweet Peas and alpine plants.
To Messrs. Wallace, Colchester, for hardy plants.

Silver Flora Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Cuthbert, Southgate, for Gloxinias.
To Messrs. May, Upper Edmonton, for miscellaneous plants.
To Mr. L. R. Russell, Richmond, for stove plants.

Silver Banksian Medal.

To Messrs. F. Cant, Colchester, for Roses.
To Mr. E. J. Hicks, Twyford, for Roses.
To Mr. G. W. Miller, Wisbech, for hardy plants.
To Messrs. W. Paul, Waltham Cross, for Roses.

Bronze Flora Medal.

To the Alder River Nursery, Iver Heath, for Lilics.
To Mr. J. C. Allgrove, Slough, for hardy plants and shrubs.
To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Bunyard, Maidstone, for Delphiniums.
To Messrs. Cheal, Crawley, for hardy plants and shrubs.
To Mr. J. Stevenson, Wimborne, for Sweet Peas.

Bronze Banksian Medal.

To Messrs. Cannell, Eynsford, for Roses and herbaceous plants.
To Mr. J. Douglas, Great Bockham, for Border Carnations.
To Rev. J. H. Pemberton, Romford, for Roses.

Award of Merit.

To Rose 'Mermaid' (votes unanimous), from Messrs. W. Paul, Waltham Cross. A very beautiful Single Rose having foliage of the *Wickstraiana* type. The flowers, which measure about 4½ inches across, are pale yellow in colour, becoming deeper towards the central mass of golden-orange stamens. The specimens exhibited seemed to indicate that it is a very vigorous variety.

To Rose 'Miss May Marriott' (votes unanimous), from Mr. T. Robinson, Nottingham. A very beautiful sport from the well-known 'Madame Edouard Herriot', with which it is identical in growth. The flowers are of good form and of a golden apricot colour, shaded with orange on the outer petals. It is exquisite in bud.

To Rose 'Walter C. Clark' (votes 11 for, 2 against), from Messrs. W. Paul, Waltham Cross. A very fragrant deep crimson-maroon Hybrid Tea of very vigorous growth and handsome dark-green foliage. The young shoots are beautifully tinted with red.

Cultural Commendation.

To the Alder River Nursery, Iver Heath, for *Lilium Willmottiae* (Wilson), syn. *L. warleyense*.

Other Exhibits.

Mr. H. Close, Orpington : Delphinium 'Crofton Belle.'
Mr. H. Elliott, Hurstpierpoint : *Richardia Elliottiopsis*.
Mr. F. A. Jones, Trowbridge : Perpetual-flowering Carnations.
Mr. H. H. Lee, Exeter : Sweet Pea 'H. H. Lee.'
Mr. A. Perry, Enfield : hardy plants.
Mr. G. Reuthe, Keston : hardy plants.
Messrs. Stark, Great Ryburgh : Poppies.

FLORAL COMMITTEE, JULY 5, 1917.

SUB-COMMITTEE AT WISLEY.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and four members present.

The Sub-Committee inspected the trials of Delphiniums, Annual Poppies, and Eschscholzias, and made recommendations for awards to be approved by the full Committee (pp. cxiii, cxiv).

FLORAL COMMITTEE, JULY 17, 1917.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and twenty-seven members present.

Awards Recommended :—

Gold Medal.

To W. H. Holloway, Esq., Shrewsbury, for Sweet Peas.

Silver-gilt Banksian Medal.

To Messrs. Piper, Langley, for Sweet Peas and water plants.

Silver Flora Medal.

To Messrs. Blackmore & Langdon, Bath, for Delphiniums and Begonias.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. F. Cant, Colchester, for Roses.

To Mr. E. J. Hicks, Twyford, for Roses.

To Messrs. May, Upper Edmonton, for ferns.

To Mr. L. R. Russell, Richmond, for shrubs.

Silver Banksian Medal.

To the Alder River Nursery, Iwer Heath, for Lilies.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Messrs. Brown, Peterborough, for Roses.

To Messrs. Harkness, Hitchin, for Roses.

To Messrs. W. Paul, Waltham Cross, for Roses.

Bronze Flora Medal.

To Messrs. Cutbush, Highgate, for Carnations.

To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Banksian Medal.

To Messrs. Cheal, Crawley, for shrubs &c.

To Rev. J. H. Pemberton, Romford, for Roses.

Award of Merit.

To H.T. Rose 'Irish Afterglow' (votes 10 for, 2 against), from Messrs. Alex. Dickson, Newtownards. A beautiful sport from the well-known 'Irish Fireflame.' The flowers, which are single, measure from 3 to 4 inches across and are golden-orange in colour when first open, but assume a pink shade with age. They possess the true Tea scent.

To Rose 'Sunstar' (votes 13 for, 1 against), from Messrs. Alex. Dickson, Newtownards. An H.T. variety of good form and pleasing fragrance. Its colour is carmine-red shaded with gold at the base of the petals.

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To *Sambucus racemosa plumosa tenuifolia* (votes, unanimous), from Messrs. G. Paul, Cheshunt. A very graceful shrub having the leaflets divided into long narrow segments, giving the foliage an almost fern-like appearance. The very attractive coral-red berries are borne in large clusters.

Other Exhibits.

Mr. G. R. Downer, Chichester: Gaillardia 'Downer's Double,' and Delphinium 'G. R. Downer.'

Mr. C. Elliott, Stevenage: Delphinium 'Blue Rocket.'

Misses Hopkins, Shepperton: hardy plants.

Mr. F. A. Jones, Trowbridge: Carnation 'Claremont.'

Mr. H. H. Lee, Exeter: Sweet Pea 'H. H. Lee.'

S. Morris, Esq., Norwich: Lonicera F 269.

The following awards recommended by the Sub-Committee to Delphiniums, Eschscholzas, and Annual Poppies on trial at Wisley were confirmed by the full Committee.

DELPHINIUMS.

Award of Merit.

No. 90, 'Col. Sir Wyndham Murray,' sent by Messrs. Blackmore & Langdon.

Nos. 188, 189, 'Capri,' sent by Messrs. Barr and Ruys.

Nos. 183, 184, 'Harry Smetham,' sent by Messrs. Ruys and Blackmore & Langdon.

Nos. 227, 228, 229, 'Moerheimii,' sent by Messrs. Barr, Ruys, and Forbes.

No. 103, 'Rozenlust,' sent by Mr. Ruys.

No. 186, 'Kingston Queen,' sent by Messrs. Smith.

No. 190, 'Lady Georgina Legge,' sent by Messrs. Kelway.

No. 89, 'Lady Hammick,' sent by Messrs. Blackmore & Langdon.

No. 120, 'Mrs. A. J. Watson,' sent by Messrs. Blackmore & Langdon.

No. 127, 'Mrs. Shirley,' sent by Messrs. Blackmore & Langdon.

No. 88, 'Professor Coleman,' sent by Messrs. Baker.

Highly Commended.

Nos. 100, 101, 'Acroplane,' sent by Messrs. Barr and Ruys.

No. 35, 'Attraction,' sent by Messrs. Forbes.

No. 92, 'Dawn,' sent by Messrs. Kelway.

No. 166, 'Dr. Lodwidge,' sent by Messrs. Kelway.

No. 9, 'Edwin Beckett,' sent by Messrs. Baker.

No. 62, 'Florence,' sent by Messrs. Forbes.

No. 67, 'Galicia,' sent by Messrs. Baker.

No. 55, 'His Excellency,' sent by Messrs. Barr.

No. 125, 'Amos Perry,' sent by Mr. Ruys.

No. 192, *Belladonna grandiflora*, sent by Mr. Ruys.

No. 106, 'Corry,' sent by Mr. Ruys.

No. 145, 'Lady Ravensworth,' sent by Mr. Ruys.

No. 223, 'Progression,' sent by Mr. Ruys.

No. 98, 'Lord Curzon,' sent by Messrs. Blackmore & Langdon.

No. 105, 'Lovely,' sent by Messrs. Kelway.

No. 222, 'Luna,' sent by Messrs. Baker.

Nos. 19, 50, 'Macbeth,' sent by Messrs. Hill and Bunyard.

No. 80, 'Ma Mie,' sent by Messrs. Barr.

No. 187, 'Mrs. James Kelway,' sent by Wisley.

No. 60, 'Mrs. T. G. Baker,' sent by Messrs. Baker.

Nos. 74, 75, 'Novelty,' sent by Messrs. Blackmore & Langdon and Ruys.

No. 32, 'Rev. E. Lascelles,' sent by Messrs. Baker.

Nos. 41, 42, 'Robert Cox,' sent by Messrs. Barr and Blackmore & Langdon.

No. 115, 'Star of Devon,' sent by Messrs. Godfrey.

Commended.

Nos. 215, 216, 'Lize,' sent by Messrs. Ruys and Barr.

No. 81, 'Miss Britton,' sent by Messrs. Barr.

No. 202, 'Queen Mary,' sent by Messrs. Bunyard.

No. 47, 'Rt. Hon. A. E. Fellowes,' sent by Messrs. Kelway.

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ESCHSCHOLZIAS.

Highly Commended.

- Nos. 24, 25, 26, 'Chrome Queen,' sent by Messrs. R. Veitch, Barr, and Watkins & Simpson.
Nos. 17, 18, *crocea compacta* 'Mandarin,' sent by Messrs. Sydenham and Barr.
No. 8, 'Golden West,' sent by Messrs. Barr.

ANNUAL POPPIES.

Award of Merit.

- No. 21, 'Dwarf Scarlet Fringed,' sent by Messrs. R. Veitch.
No. 20, 'Scarlet King,' sent by Messrs. Barr.

Highly Commended.

- No. 24, 'Cardinal Blush,' sent by Messrs. Dobbie.
No. 25, 'Cardinal Scarlet,' sent by Messrs. Dobbie.
No. 5, 'Dainty Lady,' sent by Messrs. Barr.
No. 7, 'Danebrog,' sent by Messrs. Barr.
No. 52, 'Peacock Poppy' (*P. pavoninum*), sent by Messrs. Barr.
No. 13, Strain of 'Dwarf Double' Pæony-flowered mixed, sent by Messrs. Barr.
Nos. 37 and 38, Strain of 'New Double Queen,' sent by Messrs. Barr and Messrs. R. Veitch.
Nos. 50 and 51, *umbrosum*, sent by Messrs. Dobbie and Barr.
No. 4, 'The Admiral,' sent by Messrs. Barr.
No. 14, 'White Colossal,' sent by Messrs. Barr.
No. 15, 'White Swan' (syn. 'Snowdrift'), sent by Messrs. Barr.

Commended.

- No. 43, 'Picotee,' sent by Messrs. Barr.

FLORAL COMMITTEE, JULY 20, 1917.

SUB-COMMITTEE AT WISLEY.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and three members present.

The Sub-Committee inspected the trials of Delphiniums, Eschscholzas, and Stocks, and made recommendations for awards for the approval of the full Committee (p. cxv).

FLORAL COMMITTEE, JULY 31, 1917.

Mr. E. A. BOWLES, M.A., V.M.H., in the Chair, and twenty-one members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. Kelway, Langport, for Gladioli.

Silver Flora Medal.

To Messrs. Cheal, Crawley, for flowering shrubs.
To Messrs. Jones, Lewisham, for Phloxes.

Silver Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. May, Upper Edmonton, for ferns.
To Mr. G. Reuthe, Keston, for hardy plants.
To Mr. L. R. Russell, Richmond, for foliage of trees and shrubs.
To Messrs. Vert, Saffron Walden, for Hollyhocks.

Bronze Flora Medal.

To Mr. J. C. Allgrove, Slough, for *Thalictrum dipterocarpum* &c.

Bronze Banksian Medal.

To Messrs. Piper, Langley, for hardy plants.

First-class Certificate.

To *Thalictrum dipterocarpum* (votes 12 for, 4 against), from Mr. J. C. Allgrove, Slough. This beautiful herbaceous plant received an Award of Merit on August 18, 1908. The height of the plant is from 4 to 5 feet, and the attractive rose-purple flowers with conspicuous citron-yellow anthers are borne in graceful loose panicles.

Award of Merit.

To *Anemone vitifolia tomentosa* (votes unanimous), from Mr. J. C. Allgrove, Slough. A very striking herbaceous plant having large leaves dark green above and covered with a fine white tomentum on the under side. The flowers are pink shaded with rose outside, and are borne in great abundance on many-branched stems. The height of the plant is 3-4 feet, and it was collected in China by Purdom in 1909.

To *Gentiana Purdomii* (votes 15 for, 1 against), from Mr. J. C. Allgrove, Slough. A very fine Gentian of prostrate habit introduced from China. The flowers are long, deep blue in colour, with small white spots on the lobes of the perianth, white throated and borne in great profusion along the trailing growths. The leaves are long and narrow.

To *Gladiolus 'Sunspot'* (votes 11 for, 3 against), from Messrs. Kelway, Langport. A very fine variety. The colour is pale salmon-pink over a cream ground and the three lower petals are blotched with scarlet.

Other Exhibits.

Mr. H. Close, Orpington: hardy plants.

Messrs. Dobbie, Edinburgh: *Antirrhinum 'Fusilier'* and *Clarkia 'The Bride'*.

Mr. G. R. Downer, Chichester: *Echinaccas 'Cicely'* and *'Gladys.'*

The following awards recommended by the Sub-Committee to Delphiniums, Eschscholzas, and Stocks on trial at Wisley were confirmed.

DELPHINIUMS.

Award of Merit.

No. 192, *Belladonna grandiflorum*, sent by Mr. Ruys.

Nos. 12, 13, *'Lamartine,'* sent by Messrs. Barr and Ruys.

Highly Commended.

No. 68, *'Conspicua,'* sent by Messrs. Blackmore & Langdon.

Nos. 5, 7, *'Daniel Ostris,'* sent by Messrs. Blackmore & Langdon and Ruys.

No. 29, *'Hamlet,'* sent by Messrs. Bunyard.

No. 77, *'Lord Lansdowne,'* sent by Messrs. Blackmore & Langdon.

No. 52, *'Nobilis,'* sent by Messrs. Baker.

No. 135, *'Perfection,'* sent by Messrs. Blackmore & Langdon.

No. 131, *'Sergeant Béranger,'* sent by Messrs. Blackmore & Langdon.

No. 135, *'Statuaire Rude,'* sent by Messrs. Blackmore & Langdon.

ESCHSCHOLZIAS.

Award of Merit.

Nos. 17, 18, *crocea compacta 'Mandarin,'* sent by Messrs. Sydenham and Barr.

Nos. 19, 23, *'Mikado,'* sent by Messrs. Carter and Barr.

Highly Commended.

No. 11, *'Orange King,'* sent by Messrs. Watkins & Simpson.

STOCKS (OUTDOOR).

Award of Merit.

Nos. 39, 40, 74, *'Old Rose,'* sent by Messrs. Barr, R. Veitch, and Barr.

Nos. 54, 55, 56, *'Queen Alexandra,'* sent by Messrs. Simpson, R. Veitch, and Barr.

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Highly Commended.

- No. 24, 'Almond Blossom,' sent by Messrs. R. Veitch.
No. 10, 'Bianca,' sent by Messrs. Barr.
Nos. 77, 78, 'Canary Yellow,' sent by Messrs. Barr.
No. 47, 'Mammoth Crimson,' sent by Messrs. R. Veitch.
Nos. 18, 19, 'Princess Alice,' sent by Messrs. Barr and Simpson.
Nos. 20, 21, 'Princess Alice Improved,' sent by Messrs. Barr, and Watkins & Simpson.
No. 65, 'Rich Purple,' sent by Messrs. Barr.
Nos. 27, 29, 30, 31, 32, 34, 'Souvenir de Nice,' sent by Messrs. Barr, Simpson, R. Veitch, and Barr.
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FLORAL COMMITTEE, AUGUST 14, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-four members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Kelway, Langport, for Gladioli.

Silver Flora Medal.

To Mr. J. Box, Haywards Heath, for hardy plants.
To Messrs. May, Upper Edmonton, for ferns.

Silver Banksian Medal.

To the Alder River Nursery, Iver Heath, for Lilies.
To Messrs. Allwood, Haywards Heath, for Carnations.
To Messrs. Cheal, Crawley, for shrubs and Dahlias.
To Mr. G. Reuthe, Keston, for hardy plants.

Award of Merit.

To Gladiolus 'Lady Rosemary Portal' (votes unanimous), from Messrs. Kelway, Langport. A good creamy white variety streaked with crimson at the base of the flowers, which are borne in a bold spike.

Cultural Commendation.

To W. B. Cranfield, Esq., Enfield Chase, for *Athyrium Filix-foemina clarissimum*. The fine plant exhibited was a division of the original plant upon which the late Mr. C. T. Drury, V.M.H., discovered the phenomenon of apospory. It was found by R. Moule in North Devon in 1868 and passed into the possession of the late Col. Jones. The fern is the rarest and one of the most beautiful of our native *Athyrium* family.

Other Exhibits.

S. Morris, Esq., Norwich: Montbretias 'Tangerine,' 'Queen Mary,' and 'Queen Adelaide.'
Mr. W. Wells, Merstham: Phlox 'Thor.'

Mr. W. B. Cranfield and others spoke of the great loss sustained by the Committee by the death of Mr. C. T. Drury, V.M.H., the great fern-lover.

FLORAL COMMITTEE, AUGUST 28, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Awards Recommended :—

Silver Flora Medal.

To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. May, Upper Edmonton, for ferns.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for Dahlias.
To Mr. C. J. Ellis, Weston-super-Mare, for Eustomas.

Bronze Flora Medal.

To Mr. H. Close, Orpington, for hardy plants.
To Rev. J. H. Pemberton, Romford, for Roses.
To Mr. G. Reuthe, Keston, for hardy plants.
To Mr. C. Turner, Slough, for hardy plants.

Award of Merit.

To Dahlia 'Bianca' (votes unanimous), from Mr. C. Turner, Slough. A large pure white Decorative variety of excellent form.

To Dahlia 'Eastern Star' (votes unanimous), from Messrs. Cheal, Crawley. A purplish rose Star Dahlia with maroon shading at the base of the florets. The flowers are borne on good stiff stems.

To Dahlia 'Golden Rain' (votes unanimous), from Messrs. Stredwick, St. Leonards-on-Sea. A good clear canary-yellow Cactus variety.

To Dahlia 'Harry Crabtree' (votes 6 for), from Messrs. Stredwick, St. Leonards-on-Sea. A purplish-mauve Cactus variety.

To Dahlia 'Medallion' (votes unanimous), from Messrs. Stredwick, St. Leonards-on-Sea. A yellow Collerette variety with a light collar.

To Dahlia 'Mrs. Herbert Blackman' (votes unanimous), from Messrs. Stredwick, St. Leonards-on-Sea. A pale rose-pink Garden Cactus variety with a lighter centre.

To Dahlia 'Mrs. J. A. Jarrett' (votes 5 for, 1 against), from Mr. J. A. Jarrett, Anerley. A very showy fiery orange-red Pæony-flowered Dahlia. The florets are very broad and twisted.

To Dahlia 'Primrose Star' (votes unanimous), from Messrs. Cheal, Crawley. A primrose-yellow Star variety similar in form to 'Eastern Star.'

To *Eustoma Russellianum Ellisii* (votes unanimous), from Mr. C. J. Ellis, Weston-super-Mare. A beautiful pale-pink variety of *Eustoma Russellianum*, a little-known greenhouse plant introduced from Texas in 1835. The plants are about 2 ft. high and have ovate, acuminate, glaucous leaves. The flowers, which are borne in a terminal panicle, are very handsome and have a dark blotch at the base of each of the five pink, obovate segments of the corolla. The plant is said to remain in flower for a period of three months.

Other Exhibit.

Messrs. Bunyard, Maidstone : *Calluna vulgaris fl. pl.*

FLORAL COMMITTEE, SEPTEMBER 11, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and nineteen members present.

Awards Recommended:—*Silver Flora Medal.*

To Mr. J. B. Riding, Chingford, for Dahlias.
To Messrs. Piper, Langley, for berried shrubs.

Silver Banksian Medal.

To the Alder River Nursery, Iver Heath, for Lilies.
To Messrs. Cheal, Crawley, for fruiting trees and shrubs.
To Messrs. May, Upper Edmonton, for ferns.
To Mr. G. Reuthe, Keston, for hardy plants.
To Mr. C. Turner, Slough, for Dahlias.

Award of Merit.

To Crab Apple 'Cheal's Crimson' (votes 16 for), from Messrs. Cheal, Crawley. This very distinct and ornamental Crab is a variety of *Pyrus prunifolia*, and its dark red fruits are much rounder and redder than those of the well-known Crab 'John Downie.'

To Dahlia 'Alma' (votes unanimous), from Messrs. Burreil, Cambridge. A large white Pæony-flowered variety with broad florets.

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To Dahlia 'Dominion' (votes 5 for, 1 against), from Messrs. Stredwick, St. Leonards-on-Sea. A good orange-buff Cactus variety tinged with red.

To Dahlia 'Harold' (votes unanimous), from Mr. J. T. West, Brentwood. A very effective Decorative variety. The flowers are large and of a beautiful fiery-red shade.

To Dahlia 'Mauve Star' (votes unanimous), from Messrs. Cheal, Crawley. A very dainty pale-mauve Star Dahlia.

To Dahlia 'Miss Lewis' (votes unanimous), from Mr. J. T. West, Brentwood. A pretty bright-pink Pompon Cactus variety with strong stiff stems.

To Dahlia 'Penelope' (votes 7 for), from Messrs. Burrell, Cambridge. A very effective and distinct Single Decorative variety having cerise-pink flowers striped with white borne on good stems.

To Dahlia 'Rev. John Hamlet' (votes unanimous), from R. Cory, Esq., Cardiff. A Pæony-flowered variety having flowers of good size and of a very striking and beautiful shade of bright pink. The base of the floret is golden yellow.

To Dahlia 'Seahorse' (votes 4 for, 2 against), from Mr. J. T. West, Brentwood. A good form of Decorative Dahlia having deep-yellow flowers tipped with white.

To Dahlia 'St. Egwyn' (votes 5 for, 2 against), from Mr. C. Turner, Slough. A bright-pink Pæony-flowered variety.

To Dahlia 'Tey Bell' (votes 6 for, 1 against), from Messrs. Dobbie, Edinburgh. A dark crimson-maroon Collerette variety with a white collar streaked with crimson.

To Dahlia 'The Guardian' (votes unanimous), from Messrs. Stredwick, St. Leonards-on-Sea. A very showy, large-flowered Garden Cactus Dahlia. The colour is bright red.

To Dahlia 'W. Dunn' (votes 4 for), from Messrs. Burrell, Cambridge. A scarlet Collerette variety with a yellow collar.

Other Exhibits.

Messrs. Allwood, Haywards Heath: Carnations.
Messrs. Alex. Dickson, Newtownards: Dahlia 'Hawmark Star' and Sarsaparilla flower 'Cactus Star.'

Mr. J. A. Jarrett, Anerley: Dahlias.

FLORAL COMMITTEE, SEPTEMBER 25, 1917.

Mr. H. B. MAY, V.M.H., in the Chair and twenty-seven members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. F. Cant, Colchester, for Roses.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

Silver Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. Cheal, Crawley, for shrubs and Dahlias.

To Messrs. Alex. Dickson, Newtownards, for Roses.

To Mr. E. J. Hicks, Twyford, for Roses.

To Messrs. Piper, Langley, for shrubs.

To Mr. J. B. Riding, Chingford, for Dahlias.

Bronze Flora Medal.

To Mr. J. C. Allgrove, Slough, for *Rosa Moyesii*.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Rev. J. H. Pemberton, Romford, for Roses.

To Mr. G. Reuthe, Keston, for hardy plants.

Bronze Banksian Medal.

To Mr. W. Wells, Jun., Merstham, for Asters and Delphiniums.

Award of Merit.

To Aster 'Joan Vaughan' (votes 15 for), from Messrs. Baker, Wolverhampton. An early flowering variety of the *Novi Belgii* section growing 6 ft. high.

The flowers are semi-double, $1\frac{1}{2}$ in. across, and of a lobelia-blue colour (shade 1, "Répertoire de Couleurs").

To *Ceratostigma Willmottiana* (votes 15 for), from Miss E. Willmott, V.M.H., F.L.S., Great Warley. A hardy shrubby species which has already attained the height of 6 ft. in the garden of the exhibitor. The flowers, which are a beautiful deep marine-blue colour, are borne in great profusion on the old wood in May and later in autumn on the young growths, so that the period of flowering may be said to last about six months.

To Dahlia 'Autocrat' (votes unanimous), from Mr. J. A. Jarrett, Anerley. A Colletterte variety having a good stem. The florets are fiery-red tipped with yellow and the collar is bright yellow.

To Dahlia 'Blush Star' (votes 5 for, 1 against), from Messrs. Cheal, Crawley. A pale-pink Star Dahlia having a beautiful orange centre which contrasts pleasingly with the rest of the flower.

To Dahlia 'Cambria' (votes unanimous), from Messrs. Burrell, Cambridge. A very effective, large, rose-pink Decorative variety.

To Dahlia 'Fire King' (votes unanimous), from Mr. C. Turner, Slough. A fiery-red Colletterte variety with a yellow collar. The flowers are borne on good stiff stems.

To Dahlia 'Mark' (votes unanimous), from Messrs. Burrell, Cambridge. A large bright fiery-red Pæony-flowered Dahlia.

To Dahlia 'Mrs. Ed. Moss' (votes 5 for, 2 against), from Messrs. Burrell, Cambridge. A very pretty pale-pink Pæony-flowered variety.

To Dahlia 'Mrs. J. A. Jarrett' (votes 6 for, 1 against), from Mr. J. A. Jarrett, Anerley. A crimson Colletterte variety tipped with white and having a crimson and white collar.

To Dahlia 'Planet' (votes unanimous), from Messrs. Burrell, Cambridge. A crimson maroon Colletterte Dahlia with very good stems. The collar is white tinged with crimson.

To Dahlia 'Sincerity' (votes 6 for, 1 against), from Messrs. Burrell, Cambridge. A bright-red Pæony-flowered variety with good stiff stems.

To Dahlia 'Snow Cloud' (votes 5 for), from Messrs. Stredwick, St. Leonards-on-Sea. A good white Colletterte variety of nice shape with a very full collar of the same colour.

To 'Dahlia Transport' (votes 6 for, 2 against), from Messrs. Stredwick, St. Leonards-on-Sea. A white Decorative variety tipped with pale pink. The blooms are borne on good stems.

Other Exhibits.

Mr. E. Ballard, Colwall: Asters.

Mr. G. H. Quint, Princes Risboro': Dahlia 'Mrs. G. H. Quint.'

FLORAL COMMITTEE, OCTOBER 23, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. May, Upper Edmonton, for ferns.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for autumn foliage.

To Mr. E. J. Hicks, Twyford, for Roses.

To Mr. F. Lilley, Guernsey, for Nerines.

To Messrs. Piper, Langley, for berried shrubs.

Bronze Banksian Medal.

To the Alder River Nursery, Iwer Heath, for Lilies and autumn foliage.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Rev. J. H. Pemberton, Romford, for Roses.

To Mr. G. Reuthe, Keston, for Nerines and hardy plants.

First-Class Certificate.

To *Berberis polyantha* (votes, unanimous), from the Gardens of the Royal Horticultural Society, Wisley.

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Award of Merit.

To *Vitis betulifolia* (votes 13 for), from Mrs. Berkeley, of Spetchley, Worcester. A useful climber collected by Mr. E. H. Wilson, V.M.H., bearing bunches of large bluish-black fruits. The leaves, which are ovate and cordate at the base, assume a bronzy red tint in autumn.

Other Exhibit.

Mr. C. Turner, Slough: Aster 'Snow Bunting.'

FLORAL COMMITTEE, NOVEMBER 6, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Silver Banksian Medal.

To Messrs. May, Upper Edmonton, for ferns and Begonias.

To Messrs. Piper, Langley, for berried shrubs.

To Mr. G. Reuthe, Keston, for Nerines and hardy plants.

Bronze Flora Medal.

To Messrs. Low, Bush Hill Park, for Carnations.

Award of Merit.

To Chrysanthemum 'Alec Hervey' (votes 15 for), from Mr. H. J. Jones, Lewisham. A very large deep golden-yellow Exhibition Japanese variety of good form.

To Chrysanthemum 'Crusader' (votes 7 for, 1 against), from Messrs. Lowe & Shawyer, Uxbridge. An excellent white Decorative variety.

To Chrysanthemum 'Donald' (votes 17 for, 2 against), from Messrs. Wells, Merstham. A very effective deep rose-pink Single variety with a golden-yellow eye.

To Chrysanthemum 'General Pétain' (votes 16 for), from Messrs. Wells, Merstham. A large pale-pink Japanese variety with long curled florets.

Other Exhibits.

Messrs. Chapman, Rye: Nerines.

Messrs. Cole, Peterborough: Chrysanthemum 'Mr. H. B. Witty.'

FLORAL COMMITTEE, NOVEMBER 20, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended:—

Silver Flora Medal.

To Misses Tanner and Tate (gr. Mr. Birkinshaw), Bushey Heath, for Begonias.

Silver Banksian Medal.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

To Misses Price & Fyfe, Horsted Keynes, for Carnations.

Bronze Flora Medal.

To Messrs. Piper, Langley, for berried shrubs.

Bronze Banksian Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

To Adeline, Duchess of Bedford (gr. Mr. Dickson), Rickmansworth, for Primulas.

To Messrs. Low, Bush Hill Park, for Carnations.
To Mr. G. Reuthe, Keston, for hardy plants and Nerines.
To Messrs. Wells, Merstham, for Chrysanthemums.

Award of Merit.

To Chrysanthemum 'Brilliant' (votes 8 for) from Mr. H. J. Jones, Lewisham.
A medium-sized Decorative Japanese variety of a deep crimson colour with a golden reverse.

To Chrysanthemum 'Princess Mary' (votes 21 for), from J. B. Fortescue, Esq. (gr. Mr. Page), Maidenhead. A very large clear yellow Japanese exhibition variety. It is a sport from 'Queen Mary,' which it resembles in all respects except colour.

To Primula 'Eureka' (strain), (votes 12 for, 4 against), from Adeline, Duchess of Bedford (gr. Mr. Dickson), Rickmansworth. Primula 'Eureka,' which gives its name to this strain of remarkably large-flowered Primulas, has already received an Award of Merit. The other forms shown on this occasion have the large flowers, but differ in form and colour which varies from rose-pink to deep carmine. The following are the distinctive names given to some of the forms in this strain, 'Collette,' 'Brilliant,' 'Sir Douglas Haig,' and 'Advance.'

Other Exhibits.

Mr. G. Carpenter, Byfleet : Chrysanthemums.
Messrs. Chapman, Rye : Nerines.
Miss Greaves, Reigate : *Lonicera quinquelocularis*.
C. Scrase-Dickins, Esq., Horsham : *Helleborus niger altifolius* and *Rubus polytritis*.
Messrs. Whitelegg, Chislehurst : Chrysanthemums.

FLORAL COMMITTEE, DECEMBER 4, 1917.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Allwood, Haywards Heath, for Carnations.

Silver Banksian Medal.

To Messrs. Low, Bush Hill Park, for Carnations.

Award of Merit.

To Perpetual-flowering Carnation 'Marion Wilson' (votes unanimous), from Messrs. Allwood, Haywards Heath. This variety is a seedling raised by S. Wilson, Esq., of Epsom, in 1913, and introduced by the exhibitors. The flowers, which are large and well formed, have a yellow ground flaked with red.

To Perpetual-flowering Carnation 'Mrs. Edward Douty' (votes 17 for), from Messrs. S. Low, Bush Hill Park. A variety raised and introduced by the exhibitors, having well-formed, bright crimson, slightly scented flowers of medium size.

Other Exhibits.

Messrs. H. Chapman, Rye : Nerines.
Mr. J. Jackson, Birkenhead : Chrysanthemum 'Evelyn Boldax.'
Messrs. Piper, Langley : berried shrubs.
Mr. H. W. Ratcliff, Stanstead : seedling Chrysanthemum.

ORCHID COMMITTEE.

JULY 3, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and seventeen members present.

Awards Recommended:—

Silver Gilt Flora Medal.

To Messrs. Armstrong & Brown, Orchidhurst, Tunbridge Wells, for hybrid *Miltonias*, *Odontiodas*, and *Odontoglossums*.

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for fine specimen Orchids.

Award of Merit.

To *Odontoglossum* × 'Queen Alexandra' var. 'Memoria Lionel Crawshay' (*Harryanum* × *triumphans* 'Lionel Crawshay') (votes unanimous), from de B. Crawshay, Esq., Roscfield, Sevenoaks (gr. Mr. Stables). The largest and best form of a favourite hybrid. Flowers with the general characters of *O. Harryanum* and with all the segments broadly ovate. Sepals and petals dark red-brown with a few yellow markings. Lip very broad, white in front, purple at the base.

Preliminary Commendation.

To *Odontioda* × 'Memoria Lionel Crawshay' (*Odm.* × 'Urania' × *Oda.* × *Charlesworthii*) (votes unanimous), from de B. Crawshay, Esq. The plant bore one large flower of fine substance, pale brownish-orange in colour.

Other Exhibits.

de B. Crawshay, Esq., *Odontoglossum* × 'Cleopatra' var. 'Memoria Lionel Crawshay.'

H. T. Pitt, Esq.: *Bulbophyllum Balfourianum*.

Messrs. Sander, St. Albans: species and hybrids.

ORCHID COMMITTEE, JULY 17, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and sixteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrid *Odontoglossums* and *Cattleyas*.

To Messrs. Armstrong & Brown, Tunbridge Wells, for *Odontiodas*, *Odontoglossums* and *Miltonias*.

Preliminary Commendation.

To *Odontoglossum* × 'Lilian' ('Dora' × 'Empress of India') (votes unanimous), from Messrs. Charlesworth. Flower of the *O. crispum* type with the labellum expanded by the influence of *O. Pescatorei*, which is one of the parents of *O.* × 'Dora.' Flower broad in all its parts, white with violet spotting on the inner parts of the segments.

ORCHID COMMITTEE, JULY 31, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and ten members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid *Cattleyas* and *Laeliocattleyas*.

To Messrs. Charlesworth, Haywards Heath, for hybrid Orchids.

Award of Merit.

To *Cattleya* × 'Rosita' ('Prince John' × *iridescens*) (votes unanimous), from Messrs. Armstrong & Brown. Flower large and of fine shape. Sepals and petals salmon-pink with a yellow shade. Lip magenta-crimson with bright yellow disc.

To *Cattleya* × 'Princess Royal' ('Fabia' × *Hardyana*) (votes 6 for, 3 against), from Messrs. Charlesworth. Flower resembling a dark *C. Hardyana*. Deep rose-purple with ruby-red lip having gold lines from the base.

Other Exhibits.

Baron Bruno Schröder: *Cattleya* × *illustris* var. 'Savoyard' ('Acis' × *iridescens*), a bright yellow flower with light purple front to the lip.

J. Ansaldo, Esq., Rosebank, Mumbles: *Sophrolaeliocattleya* × 'Corona,' Ansaldo's variety (*L.-c.* × 'Rubens' × *S.-l.-c.* × 'Dorila'). The flower closely approaches *Laelia pumila*, which is in each of the parents, both in colour and form.

ORCHID COMMITTEE, AUGUST 14, 1917.

Sir HARRY J. VEITCH, F.L.S., in the Chair, and fifteen members present.

Awards Recommended:—*Silver Flora Medal.*

To Messrs. Armstrong & Brown, Orchidhurst, Tunbridge Wells, for hybrid *Cattleyas* and *Laeliocattleyas*.

To Messrs. Charlesworth, Haywards Heath, for *Odontoglossums* and hybrid *Cattleyas*.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for a group.

Award of Merit.

To *Cattleya* × 'Albion' (*O'Brieniana alba* × 'Suzanne Hye de Crom') (votes unanimous), from Messrs. Armstrong & Brown. A compact flower of fine substance, pure white with chrome-yellow disc to the lip.

To *Cattleya* × *triumphans* var. 'The Baron' ('Rex' × *Dowiana aurea*) (votes unanimous), from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). Flower intermediate between the two parents. Sepals and petals bright yellow, lip magenta-crimson with rose margin and gold lines from the base to the centre.

Other Exhibits.

Messrs. Flory & Black: *Brassocattleya* × 'Ilene.'

ORCHID COMMITTEE, AUGUST 28, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fifteen members present.

Awards Recommended:—*Silver Flora Medal.*

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrids.

To Messrs. Charlesworth, Haywards Heath, for *Laeliocattleyas*, *Odontoglossums*, &c.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for interesting species and hybrids.

First-class Certificate.

To *Brassocattleya* × 'Lady Veitch' (parentage unrecorded) (votes unanimous), from Messrs. Flory & Black, Slough. A large and finely formed silver-white flower with a slight blush tint and some indistinct purple lines on the petals. The disc of the fringed lip is light orange.

CXXIV PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

Award of Merit.

To *Laeliocattleya* × *canhaminosa* (*Canhamiana* × *luminosa*) (votes unanimous), from Messrs. Armstrong & Brown. Sepals and petals light yellow; the frilled lip rosy-mauve colour with golden disc.

To *Cattleya* × 'Mrs. Pitt,' Charlesworth's variety (*Harrisoniana* × *Dowiana aurea*) (votes 11 for), from Messrs. Charlesworth. The spike bore four magenta-crimson flowers. Front of the lip purplish-crimson, the disc golden-yellow.

To *Cattleya* × 'Naidia' *exquisita* (*iridescens* × *Hardyana*) (votes 7 for), from Messrs. Hassall, Southgate. Flowers fragrant, sepals and petals yellowish-salmon colour. Lip crimson with yellow disc.

Other Exhibits.

Baron Bruno Schröder: hybrid Cattleyas.

Messrs. Flory & Black: *Brassocattleya* × 'Ilene.'

Messrs. Hassall: hybrids of *Cattleya* × *iridescens*.

ORCHID COMMITTEE, SEPTEMBER 11, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and sixteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrids.

To Messrs. Armstrong & Brown, Tunbridge Wells, for *Laeliocattleyas*, *Odontoglossums* and *Odontiodas*.

Silver Banksian Medal.

To Messrs. Sanders, St. Albans, for a group.

Award of Merit.

To *Laeliocattleya* × 'Commander-in-Chief' (*C.* × 'Iris' × *L.-c.* × 'Mrs. Evelyn Norrie') (votes unanimous), from Messrs. Armstrong & Brown. Sepals and petals well displayed, bright citron-yellow; lip claret-crimson with a network of golden-yellow lines extending from the base to the centre. Columna fleshy, white.

To *Laeliocattleya* × 'Bronze King' ('Anaconda' × *luminosa*) (votes unanimous), from Messrs. Armstrong & Brown. Flowers large and with broad segments. Sepals and petals yellow slightly tinged with rose on the outer halves. Lip magenta-crimson with lighter margin, and bronzy-yellow disc.

Other Exhibits.

Sir Jeremiah Colman, Bt.: *Laeliocattleya* × 'Hélène' (*L.-c.* × *bletchleyensis* × *C.* × 'Adula').

Messrs. Hassall, Southgate: hybrid Cattleyas.

Messrs. Flory & Black, Slough: hybrids.

ORCHID COMMITTEE, SEPTEMBER 25, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fourteen members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Orchidburst, Tunbridge Wells, for hybrid Cattleyas and *Laeliocattleyas*.

To Messrs. Charlesworth, Haywards Heath, for hybrids and rare species.

To Messrs. Hassall, Southgate, for Cattleyas and *Brassocattleyas*.

Silver Banksian Medal.

To Messrs. Sander, St. Albans, for a group.

Award of Merit.

To *Cattleya* × *Iris*, Orchidhurst var. (*bicolor* × *Dowiana aurea*) (votes 10 for), from Messrs. Armstrong & Brown. Sepals and petals bronzy yellow, lip rosy mauve with yellow marking in the centre.

To *Brassocattleya* × 'Ilene,' 'The Bride' (*B.-c.* × 'Mme. Chas. Maron' × *C. Dowiana aurea*) (votes 8 for, 1 against), from Messrs. Hassall, Southgate. A large flower light rose-pink in colour and with oblong yellow patches on the lip.

Other Exhibits.

Messrs. Flory & Black, Slough: *Laeliocattleya* × 'Soulange' (*L.-c.* × 'Lustre' × *C. Dowiana aurea*).

ORCHID COMMITTEE, OCTOBER 23, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and sixteen members present.

Awards Recommended:—*Silver Gilt Flora Medal.*

To Messrs. Charlesworth, Haywards Heath, for hybrids.

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for *Cattleyas*, *Odontoglossums*, &c.

To Messrs. Sander, St. Albans, for *Cattleyas*.

Silver Banksian Medal.

To Messrs. Stuart Low, Jarvisbrook, for a group.

To Messrs. Hassall, Southgate, for hybrids.

To Messrs. McBean, Cooksbridge, for a group.

First-class Certificate.

To *Odontoglossum crispum* 'The Premier' (votes unanimous), from Messrs. Charlesworth. A grand pure white form, home-raised.

Award of Merit.

To *Sophrolaeliocattleya* × 'Roehampton' (parentage unrecorded) (votes unanimous), from Dr. Miguel Lacroze, Bryndir, Roehampton. A showy flower of deep claret-red colour and nearest to *S.-l.-c.* × *bletchleyflora*.

To *Laeliocattleya* × 'St. George,' Bryndir variety (*L.-c.* × 'St. Gothard' × *C.* × 'Fabia') (votes unanimous), from Dr. Miguel Lacroze. A large flower of fine shape, bright rosy mauve with purplish-crimson front to the lip.

To *Laeliocattleya* × 'Zeno' (*L.-c.* × 'St. Gothard' × *C.* × *Luegeae*) (votes unanimous), from Messrs. Charlesworth. Flower large, bright rose with ruby-crimson front to the lip which has a yellow centre.

Preliminary Commendation.

To *Odontoglossum* × 'Adonis' (*crispum Solum* × hybrid) (votes 11 for, 1 against), from Messrs. Armstrong & Brown. Flower nearest to *O. crispum Solum*, white with irregular claret blotches.

To *Odontoglossum* × 'Aspasia' ('Mars' × 'Colossus') (votes unanimous), from Messrs. Armstrong & Brown. A large flower heavily blotched with purple on bluish-white ground.

To *Odontoglossum* × 'Nysa' (*eximium* × 'Alexandra') (votes 10 for), from Messrs. Charlesworth. Inner parts of the segments claret-purple, the tips and margin tinted rose colour.

Other Exhibits.

Sir Jeremiah Colman, Bt.: *Cattleya* × *Browniae* with sixteen flowers on a spike, and *Odontoglossum coronarium*.

Dr. Miguel Lacroze: two hybrid *Cattleyas*.

Messrs. Flory & Black, Slough: *Laeliocattleya* × 'Phyllis.'

CXXXVI PROCEEDINGS OF THE ROYAL HORTICULTURAL SOCIETY.

ORCHID COMMITTEE, NOVEMBER 6, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and seventeen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrid *Odontoglossums*, *Cattleyas* and *Laeliocattleyas*.

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for home-raised *Cattleya Dowiana aurea*.

To Messrs. Sanders, St. Albans, for *Cattleyas* and *Laeliocattleyas*.

To Messrs. C. F. Waters, Balcombe, for hybrids.

First-class Certificate.

To *Cattleya* × 'Astron,' The Dell variety (*Harrisoniana alba* × *Dusseldorferi* 'Undine') (votes 11 for, 4 against), from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). The spike bore six pure white flowers with sulphur yellow disc to the lip. The original form was given an A.M. Nov. 3, 1914.

Award of Merit.

To *Sophrolaeliocattleya* × 'Bryndir' (*S.-L.-c.* × 'Sandhage' × *L.-c.* × 'Golden Oriole') (votes unanimous), from Dr. Miguel Lacroze, Bryndir, Rye-hampton. Flower of good size and shape. Sepals and petals dark ruby-red. Lip claret-red with gold veining.

To *Brassocattleya* × *Dietrichiana*, Ansaldo's variety (*B.-c.* × 'Mrs. J. Leemann' × *C.* × 'Fabia') (votes 15 for), from J. Ansaldo, Esq., Rosebank, Mumbles. A large cream-white flower tinged with rosy lilac and with large chrome-yellow disc in the centre of the lip.

To *Miltonia* × 'Venus' var. 'Fascinator' (*vexillaria* × *Phalaenopsis*) (votes 15 for, 1 against), from Messrs. Charlesworth. Flower formed like *M. vexillaria*, light rose with dotted lines of crimson on the lip.

Other Exhibits.

Sir Jeremiah Colman, Bart.: hybrid *Cattleyas* and *Odontoglossums*.

Messrs. Stuart Low: hybrid *Cattleyas*.

Dr. Miguel Lacroze: *Cattleya* × 'Tityus' var. 'Bryndir.'

Baron Bruno Schröder: three *Laeliocattleyas*.

ORCHID COMMITTEE, NOVEMBER 20, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and fourteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for hybrids.

To Messrs. Charlesworth, Haywards Heath, for a group of the orange-coloured *Epidendrum vitellinum autumnale* and white *Odontoglossums*.

Lindley Medal.

To Messrs. Armstrong & Brown, for the new Buttercup yellow *Brassolaeliocattleya* × 'Lady Manningham Buller.'

First-class Certificate.

To *Brassolaeliocattleya* × 'Lady Manningham Buller' (*B.-c.* × *Digbyano-Mossiae* var. 'Queen Alexandra' × *L.-c.* × 'Ophir') (votes unanimous). A noble flower of a uniform clear yellow colour. From Messrs. Armstrong & Brown.

Award of Merit.

To *Sophrolaeliocattleya* x 'Anzac' var. 'Vesuvius' (S.-I.-c. x 'Marathon' x L.-c. x *Dominiana*) (votes 6 for, 3 against), from Messrs. Charlesworth. Flowers rosy-mauve with a reddish tint and light claret front to the lip.

To *Odontoglossum* x 'General Allenby' (*crispum nigrescens* x hybrid) (votes 14 for), from Messrs. Flory & Black, Slough. A well-formed white flower with claret blotches on the inner parts of the segments.

Cultural Commendation.

To Mr. J. E. Shill, gr. to Baron Schröder, for *Cattleya* 'Astron' with a fine spike of ten white flowers.

Other Exhibits.

The Duke of Marlborough: two hybrid *Cattleyas*.

Sir Jeremiah Colman, Bart.: *Brassolaeliocattleya* x 'Antoinette.'

Messrs. McBean: a group.

Messrs. Flory & Black: hybrid Orchids.

ORCHID COMMITTEE, DECEMBER 4, 1917.

Sir JEREMIAH COLMAN, Bt., in the Chair, and seventeen members present.

Awards Recommended:—

Williams Gold Medal.

To Messrs. Armstrong & Brown, Tunbridge Wells, for group of hybrids.

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for *Odontoglossums* and *Laelio-cattleyas*.

Silver Banksian Medal.

To Messrs. Sanders, St. Albans, for hybrid *Cypripediums*.

Award of Merit.

To *Sophrocattleya* x 'Faboris' (C. x 'Fabia' x S.-c. x 'Doris') (votes 10 for), from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). Flower large. Sepals and petals pale yellow, lip rose colour veined with reddish purple.

To *Cypripedium insigne* var. 'Louis Sander' (votes 12 for), from Messrs. Sanders, St. Albans. A large form similar to the Harefield Hall variety but with darker and larger spotting on the dorsal sepal.

Other Exhibits.

Dr. Miguel Lacroze: *Sophrolaeliocattleya* x 'Marathon,' Bryndir variety

Messrs. E. H. Davidson: *Sophrocattleyas*,

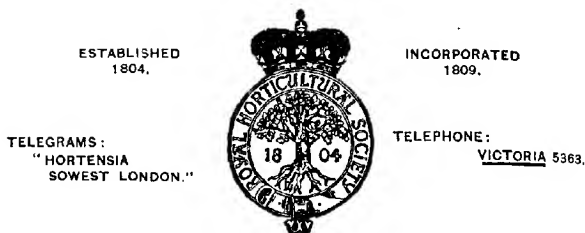
Messrs. Stuart Low: hybrids.

CERTIFICATES OF DILIGENT INTEREST IN PLANTS, 1917.

Edith Gillespie for the best kept plot in the Waterloo Wesleyan School garden.

May Mackay for the best collection of vegetables grown in the Waterloo Wesleyan School garden.

Fred Blake for work in the Hosey Boys' School garden, Westerham.



ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W. 1.

NOTICES TO FELLOWS.

1. Important Notices.
2. Subscriptions.
3. Form of Bequest.
4. New Fellows.
5. An Appeal.
6. The Society's Gardens at Wisley.
7. Students at Wisley.
8. Distribution of Surplus Plants.
9. National Diploma in Horticulture.
10. Examinations, 1919.
11. Information.
12. Inspection of Fellows' Gardens.
13. Affiliation of Local Societies.
14. R.H.S. Gardeners' Diary.
15. Rules for Judging—1914 Code.
16. Food Production Publications.
17. R.H.S. Pamphlets.
18. List of the Most Desirable Fruits.
19. Free Leaflets.
20. Book on Fruit Bottling.
21. R.H.S. War Relief Fund.
22. Shirley Poppy Seed.
23. Garden Charts.

I. IMPORTANT NOTICES.

1. The Society's Hall in Vincent Square being still occupied by the Australian Imperial Force, the Fortnightly Meetings will continue to be held in the London Scottish Drill Hall, Buckingham Gate, Victoria Street. It is hoped that Fellows will do their utmost to support these Meetings during their temporary transference to the Drill Hall.
2. The Lectures will be given at the Drill Hall.
3. The Society's Offices and Library will continue in Vincent Square as heretofore. The Scientific Committee will also meet as before at Vincent Square.

2. SUBSCRIPTIONS.

All annual subscriptions are payable in advance on the 1st day of January in each year. A Fellow, if elected before the 1st of July, pays the annual subscription for the current year; if elected after the 1st of July and before the 1st of October, he pays half a year's subscription; if elected after the 1st of October and before the 1st of January, he pays one full year's subscription, and no further subscription until the following January twelvemonth. To avoid the incon-

venience of remembering their subscriptions, Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1. It may be a week or more before the Tickets reach the Fellows, owing to the very large number (over 20,000) to be despatched every January. Fellows who have not already given an order on their bankers for the payment of their subscriptions are requested to do so, as this method of payment saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society," and crossed "London County and Westminster Bank, Victoria Branch, S.W. 1."

3. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £ to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of my decease; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

4. NEW FELLOWS.

The President and Council hope that existing Fellows will enlist the sympathy of all their friends, as, owing to the great increase in work which has fallen upon, or been voluntarily undertaken by, the Society, it is now more important than ever to fill the places of those who are taken from us. A letter on this subject was sent to all the Fellows in December last. Should any Fellow have failed to receive it, another copy will be sent on application to the Secretary, R.H.S., Vincent Square, London, S.W. 1.

5. AN APPEAL.

What has been accomplished for the Society is largely due to the unwearied assistance afforded by the Fellows themselves, and as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by:—

1. Increasing the Number of Fellows.
2. Presenting Books for the Library at Vincent Square and at Wisley.
3. Sending new or rare Plants, Seeds, and Roots for the Garden and for distribution to Fellows, and for helping to keep the Hospital Camps in France and Flanders, &c., furnished.

6. THE SOCIETY'S GARDENS AT WISLEY.

In connexion with the scheme approved at the 1914 Annual Meeting for the further development of the practical and scientific work at Wisley, the Council were fortunate in securing the services of Dr. Keeble, F.R.S., as Director. By friendly arrangement between the Society and the Imperial College of Science, the Wisley Gardens are now the joint Experimental Entomological Station of

* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.
The attention of Fellows is specially called to the Wisley Gardens Endowment Trust Fund, the object of which is to make the Gardens self-supporting for ever, so that the important work to which they are devoted may go on uninterrupted by any fluctuation in the Society's finances. To do this £100,000 is required. In 1914 the Council voted £25,000 towards it as a nucleus. Will not Fellows help to complete this sum?

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the Society and the Imperial College. All communications to the Gardens should be addressed to "The Director," R.H.S. Gardens, Wisley, Ripley, Surrey.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till 6 P.M., except on Sundays, Good Friday, Christmas Day, and Meeting Days. Each Fellow's Ticket admits three to the Gardens. The Public are not admitted at any time.

The Gardens are about $3\frac{1}{2}$ miles from Byfleet, $3\frac{1}{4}$ miles from Horsley, and $5\frac{1}{2}$ miles from Weybridge, all on the South-Western Railway. Carriages to convey four persons can be obtained by writing to Mr. D. White, fly proprietor, Ripley, Surrey; or motor cars can be had at Byfleet Station by applying to Mr. Finch, or Mr. Howard, Byfleet, Surrey. Accommodation and refreshments can be had at the Hut Hotel close to the Gardens, and also at the Hautboy, Ockham.

7. STUDENTS AT WISLEY.

The Society admits young men, between the ages of sixteen and twenty-two years to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Gardening, but also Lectures, Demonstrations, and Horticultural Science in the Laboratory, whereby a practical knowledge of Garden Chemistry, Biology, &c., may be obtained.

8. DISTRIBUTION OF SURPLUS PLANTS.

Some years ago the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste-heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive those surplus plants? It was, therefore, decided to keep all plants till the early spring, and then give all Fellows who had paid the current year's subscriptions the option of claiming a share of them by Ballot.

Fellows are, therefore, particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are, of necessity, *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the "Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is, therefore, obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to return their application form before April 30 must be content to wait till the next year's distribution. The work of the Garden cannot be disorganized by the sending out of plants at any later time in the year. All Fellows who have paid the current year's subscription can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. Owing to the railways declining to deliver these parcels any longer, they *must* now be sent by post, the postage being prepaid by Fellows. Directions as to the amount of the remittance to be sent will be found on the application form for plants, which kindly consult before sending it in.

Parcels will be addressed exactly as given by each Fellow on the address label accompanying his application form.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled. Plants cannot be sent to Fellows residing outside the United Kingdom. No plants will be sent to Fellows whose subscriptions are in arrear, or who do not fill up their forms properly.

9. A NATIONAL DIPLOMA IN HORTICULTURE.

Most gardeners have welcomed the initiation by the Society of a scheme whereby a National Diploma in Horticulture may be gained by those who pass the Preliminary and Final Examinations. The Diploma is thoroughly "National," for, by the consent of H.M. Government, the Department of Agriculture consented to co-operate with the Society if the Society would undertake the work of organizing the Examinations, and authorized the Diploma bearing the following words: "Awarded by the Royal Horticultural Society under a scheme approved by the Board of Agriculture."

The Examinations which are held in June are practical, *viva voce*, and written; the practical part being held in a suitable garden.

Information may be obtained by sending a directed envelope, stamped, to the Secretary, Royal Horticultural Society, Vincent Square, S.W. 1.

10. EXAMINATIONS, 1919.

The revised syllabus of the different examinations can be obtained from the Society's Office, Vincent Square, S.W. 1, post free for 1½d.

11. INFORMATION.

Fellows may obtain information and advice from the Society as to the names of flowers and fruits, on points of practice, insect and fungus attacks, and other questions, by applying to the Secretary, R.H.S., Vincent Square, Westminster, S.W. 1.* Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

12. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost, viz.: a fee of £3 3s. for one day (or £5 5s. for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their Gardens. Gardens can only be inspected at the *written* request of the *owner*.

13. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many branches of the Society's work is the affiliation of local Horticultural Societies to the R.H.S.

Numerous requests for help having recently reached the Secretary from the Allotment and Cottagers' Societies now springing up all over the Kingdom, the President and Council have responded by revising and extending the benefits offered to Affiliated Societies. It is hoped that all Societies will by Affiliation become united with the parent Society and through it with each other. Such a unity cannot fail to be attended with good and progressive results.

14. R.H.S. GARDENERS' DIARY.

The R.H.S. Gardeners' Diary for 1919 contains a considerable quantity of new information and is compiled more especially for the single-handed gardener. Fellows may obtain it from the R.H.S. Office, Vincent Square, London, S.W. 1; bound in imitation leather, 2s. over the counter, 2s. 3d. post free.

* See R.H.S. Gardeners' Diary—"How to send Specimens for Identification."

15. RULES FOR JUDGING—1914 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," have been revised. Secretaries of Local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1s. 9d., addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W. 1.

16. R.H.S. FOOD PRODUCTION PUBLICATIONS FOR THE ASSISTANCE OF COTTAGE AND ALLOTMENT GARDEN SOCIETIES.

To assist the rapidly growing army of Allotment Holders and Cottage Gardeners the Society has had the following publications prepared:—

| | Post free. |
|--|------------|
| | s. d. |
| Rules and Regulations for Allotment Societies | 2 |
| Rules for Judging Cottage and Allotment Gardens | 2 |
| Companion Judges Sheet for ditto | 3 |
| Rules for Allotment and Vegetable Exhibitions | 2 |
| Vegetable Bottling and Fruit Preserving without Sugar, by Mr. and Mrs. Banks (including valuable recipes for Jams and Jellies) | 1 8 |

Printed lectures, illustrated with lantern slides, have been prepared for the use of Societies of Allotment Holders. For particulars apply to the Secretary, R.H.S. Vincent Square, S.W. 1.

17. R.H.S. POPULAR PRACTICAL PAMPHLETS.

The following pamphlets can be ordered from the Royal Horticultural Society, Vincent Square, London, S.W. 1. They have been prepared with a view of meeting the needs of the present urgent times and will be found eminently practical and useful. The enormous increase in the cost of paper and printing has entailed a further revision of the price of these Pamphlets, which until further notice will be 6d. each, by post, 7d.

FOOD PAMPHLETS:—

- (e) Vegetables and How to Grow Them.
- (f) Vegetables from Seed sown in July and August.
- (g) The Cultivation and Manuring of the Garden.
- (r) Potatoes in Gardens and Allotments.
- (w) Potato Growing—Spring work.
- (x) Potato Growing—Autumn work.
- (y) Potato Growing, Some Experiments in.
- (v) Cropping Allotments and Small Gardens.
- (a) List of Hardy Fruits, with Cultivation.
- (c) The Pruning of Fruit Trees.
- (b) The Training of Fruit Trees.
- (d) Keeping Fruit Trees Clean.
- (h) Fruit and Vegetable Bottling and Storing.
- (m) Vegetable Cookery.
- (n) Salads and Salad Making.

OTHER GARDEN PAMPHLETS:—

- (g) The Herbaceous Garden.
- (h) The Rose Garden.
- (e) Flowers for Small Gardens, Window Boxes, &c.
- (f) Hardy and Half-Hardy Annuals in the Open Air
- (o) War-time Economy in Gardening.
- (p) Medicinal Plants and their Cultivation.
- (s) Fruit Cultivation under Glass.
- (t) The Pruning of Hardy Shrubs.
- (u) The Children's Garden.

500,000 of these Pamphlets have been sent out since 1915.

18. LIST OF THE MOST DESIRABLE VARIETIES OF FRUIT.

DRAWN UP BY THE FRUIT COMMITTEE.

Orders for this list may now be given. Its price is 2s. post free. It contains nearly 200 pages, and besides the original list drawn up by the Committee, it gives lists of varieties recommended by nearly 100 expert growers and gardeners all over the country for their respective geographical divisions of Great Britain. The list shows the result of a ballot as to which varieties are to be preferred from such points of view as vigour of constitution, and for various types of growth and cultivation, as, *e.g.*, in the case of Apples—Bush, Standard, Espalier; Pears—Bush, Standard, Espalier, Wall. It also shows the best varieties for cooking as distinct from dessert, the best for markets, and much similar detailed information which must prove of great help in these days when the planting of more fruits as well as of more vegetables is so widely recognized as being of urgent necessity.

19. FREE LEAFLETS.

The following leaflets may be had free on receipt of a $\frac{1}{2}$ d. stamped addressed envelope:

Fruit Bottling for Cottagers.
Lady Carbery's Recipe for Preserving Fruits.
R.H.S. Dutch Brown Beans.
The Cultivation of Beans for Winter Consumption.
A List of R.H.S. Gardening Charts for Societies and Schools.

20. BOOK ON FRUIT AND VEGETABLE BOTTLING.

Fellows of the Society have shown exceptional interest in the long series of lectures given during this year at the Fortnightly Meetings by Mr. and Mrs. Vincent Banks on Fruit and Vegetable Bottling, who have now, in response to many requests, prepared a book on the subject. The Council, recognizing the value of the information it contains, and the demand for instruction of this kind, have published it. It contains the most up-to-date information on the subject and is most practical. It deals not only with the Bottling of both Fruits and Vegetables, but also with the making of Jam, and the pulping of Fruit to be made into Jam later on, when sugar supplies are more abundant than they are just now. There are also many useful household recipes, and all the information given is the result of the actual experience of the authors extending over a long number of years. Mr. and Mrs. Banks' exhibits of Bottled Fruits at the Society's Meetings are well known to the Fellows for their excellence. The price of the 1918 revised edition, which may be obtained from the R.H.S., Vincent Square, London, S.W. 1, is 1s. 6d. over the counter, or post free 1s. 8d.; bound in stiff paper covers.

21. R.H.S. WAR RELIEF FUND.

The work of the Society having greatly increased since the outbreak of the War and the staff having greatly diminished, the Council found that the management of this fund imposed far too great a demand upon the staff, a demand indeed which it was impossible to meet. A special Administrative Committee for the War Relief Fund was, therefore, appointed. The Committee is composed of Members of the Council, and of the Ladies' Executive Committee which has done such admirable work in collecting money for the fund. The Office of the Fund is at 17 Victoria Street, Westminster, S.W. 1, where all communications and donations should be addressed.

22. SHIRLEY POPPIES.

Owing to the great increase in the Society's work both in itself and on behalf of the Increase of Food Production of the Government, Mr. Wilks is unable to undertake the distribution of Poppy Seed this year. He has, therefore, given

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all his 1918 crop of seed to the Society, and it will be found listed with the other seeds in the Annual Distribution which takes place in March and April.

23. GARDEN CHARTS.

In the spring of the year it was made known that our Society was engaged in preparing a series of garden charts. It was hoped that they would be completed and ready for use this winter. It is most disappointing that our hopes in this respect have not been realised; but we have had to meet untold difficulties, not the least amongst them being the fact that our colour printers' works have been commandeered by the Admiralty, which has the prior claim upon all their machines. So great has been the pressure upon the works during the past summer that we have been able to do little more than get some of our Charts "proved." By the time this notice appears, however, at least eighteen will be ready, and can be had from the Society's Office, Vincent Square, Westminster, price 3s. 6d. each.

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